

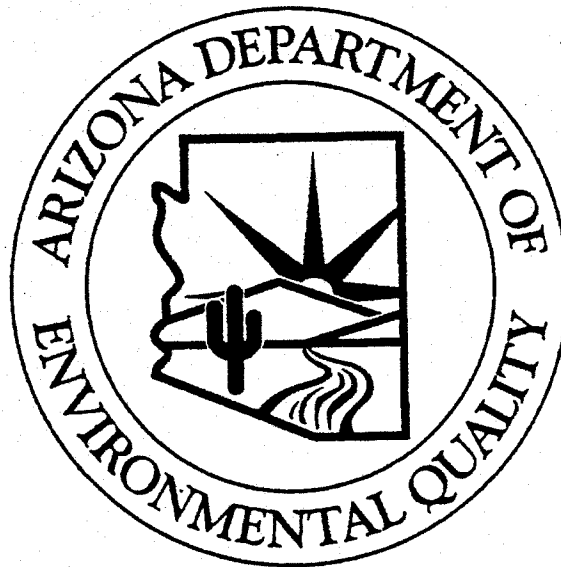
**1994 RECORD OF DECISION
FOR OPERABLE UNIT 2, 52ND STREET
SUPERFUND SITE AND 1999 EXPLANATION
OF SIGNIFICANT DIFFERENCES**

APPENDIX A

RECORD OF DECISION

OPERABLE UNIT TWO East Phoenix Groundwater Containment

**Motorola 52nd Street Superfund Site
Phoenix, Arizona**



**Motorola 52nd Street Superfund Site
Record of Decision for Operable Unit Two
East Phoenix Groundwater Containment**

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I. DECLARATION

1. Site Name and Location

Motorola 52nd Street
Phoenix, Arizona

2. Statement and Basis of Purpose

This Record of Decision (ROD) presents the interim remedial action the Arizona Department of Environmental Quality (ADEQ) and the United States Environmental Protection Agency (EPA) have selected for Operable Unit Two at the Motorola 52nd Street site in Phoenix, Arizona. This document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record for the site.

3. Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent or substantial endangerment to public health, welfare, or the environment.

4. Description of the Selected Remedy

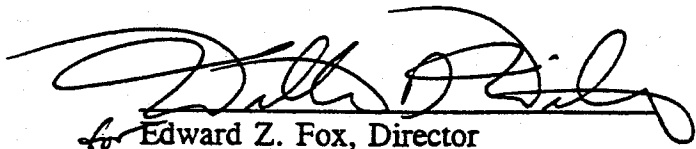
This Record of Decision is for Operable Unit Two at the site, which is an area of contaminated groundwater downgradient of Operable Unit One. In comparing and selecting remedial alternatives for Operable Unit Two, effective and continued operation of Operable Unit One was assumed. The selected remedy is an interim remedy designed to address groundwater that is contaminated with volatile organic compounds (VOCs). The major components of this remedy consist of:

- Extraction of groundwater in the vicinity of Interstate 10 and Van Buren Street.
- Treatment of extracted water near extraction locations by either air stripping with off-gas treatment by synthetic resin adsorption, or advanced oxidation based on final design considerations.
- Injection of treated water back into the aquifer in locations allowing additional control of the contaminant plume.

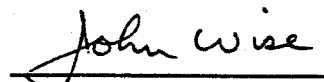
These remedial actions address the principal threat and primary risk at the Motorola 52nd Street site by establishing a capture zone across the entire width and depth of the contaminant plume and by removing and permanently destroying the contaminants from the groundwater. These actions will significantly reduce the toxicity, mobility, and volume of hazardous substances in the groundwater at the site.

5. Statutory Determinations

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus is in furtherance of that statutory mandate. Although this action does not constitute a final remedy for the Motorola 52nd Street site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element is satisfied by this remedy. Subsequent actions are planned to address fully the threats posed by the conditions at this site. Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Because this is an interim action ROD, review of this site and of this remedy will be ongoing as ADEQ continues to develop final remedial alternatives for the site.


for Edward Z. Fox, Director
Arizona Department of Environmental Quality

7-1-94
Date


John Wise
Deputy Regional Administrator
USEPA
Region IX

7.21.94
Date

II. DECISION SUMMARY

1. Site Name, Location and Description

The Motorola 52nd Street site is located in Phoenix, Arizona. Activities at this Superfund site began with the investigation of releases of hazardous substances from the Motorola, Inc. Semiconductor Products Plant at 5005 East McDowell Road, in the eastern portion of Phoenix, Arizona, in Maricopa County. Figure 1 shows the location of the Motorola plant within the Phoenix area. Investigations of this facility and investigations under Arizona's Water Quality Assurance Revolving Fund (WQARF) program have identified other potential sources of groundwater contamination. The combined releases from known and suspected sources have created extensive groundwater contamination in the area. Figure 2 shows the current known extent of trichloroethylene (TCE) contamination. As the figure indicates, the western edge of the contaminant plume has not yet been identified, but extends well beyond 7th Avenue. Other contaminants are also present; however, the known areal extent of TCE contamination reasonably encompasses the other contaminants.

The 90-acre Motorola facility is zoned for industrial use and surrounded by a mixture of light industrial and residential properties. The nearest residences are less than 100 feet from the western property boundary. Major geographic features are the Papago Buttes to the east of the plant, the Salt River flowing westerly about one mile to the south, the Old Crosscut Canal located along 46th Street, and the Grand Canal which flows northwesterly through the area west of 40th Street and Van Buren Street. Phoenix Sky Harbor Airport is located approximately 1.5 miles to the southwest. The Papago Military Reservation, a 3/4 square mile facility used by the Arizona National Guard, is located northeast and east of the plant. There are no critical habitats, wetlands, endangered species, or known historic sites in proximity to or affected by the site. This site is not situated in a flood plain.

The Motorola plant lies near the eastern margin of the west basin of the Salt River Valley. The area is underlain by alluvium, but because of the proximity of the plant to the nearby bedrock outcrops at the Papago Buttes, bedrock occurs at a relatively shallow depth. In monitor wells at the east boundary, bedrock was encountered at a depth of 20 to 30 feet below the ground. The thickness of the alluvium increases to the west. On the western boundary of the plant, the thickness of alluvium is greater than 60 feet at some locations. Farther to the west, the thickness of the alluvium continues to increase. At the Old Crosscut Canal, the alluvium is approximately 80 to 90 feet thick, and at a monitor well on 36th Street, about 2 miles west of the plant, the thickness of the alluvium is more than 200 feet.

The direction of regional groundwater flow, both in the alluvium and the bedrock, in the vicinity of the Motorola plant is predominantly from the northeast to the southwest, although local variations in this overall pattern are present. This pattern was not found to vary significantly during the course of the initial Remedial Investigation/Feasibility Study (RI/FS). From the mid-1950's until 1980, the direction of groundwater flow west of the plant may have had a more northerly component than it has had in more recent years.

The Motorola facility is paved and consists of several large buildings used for the production

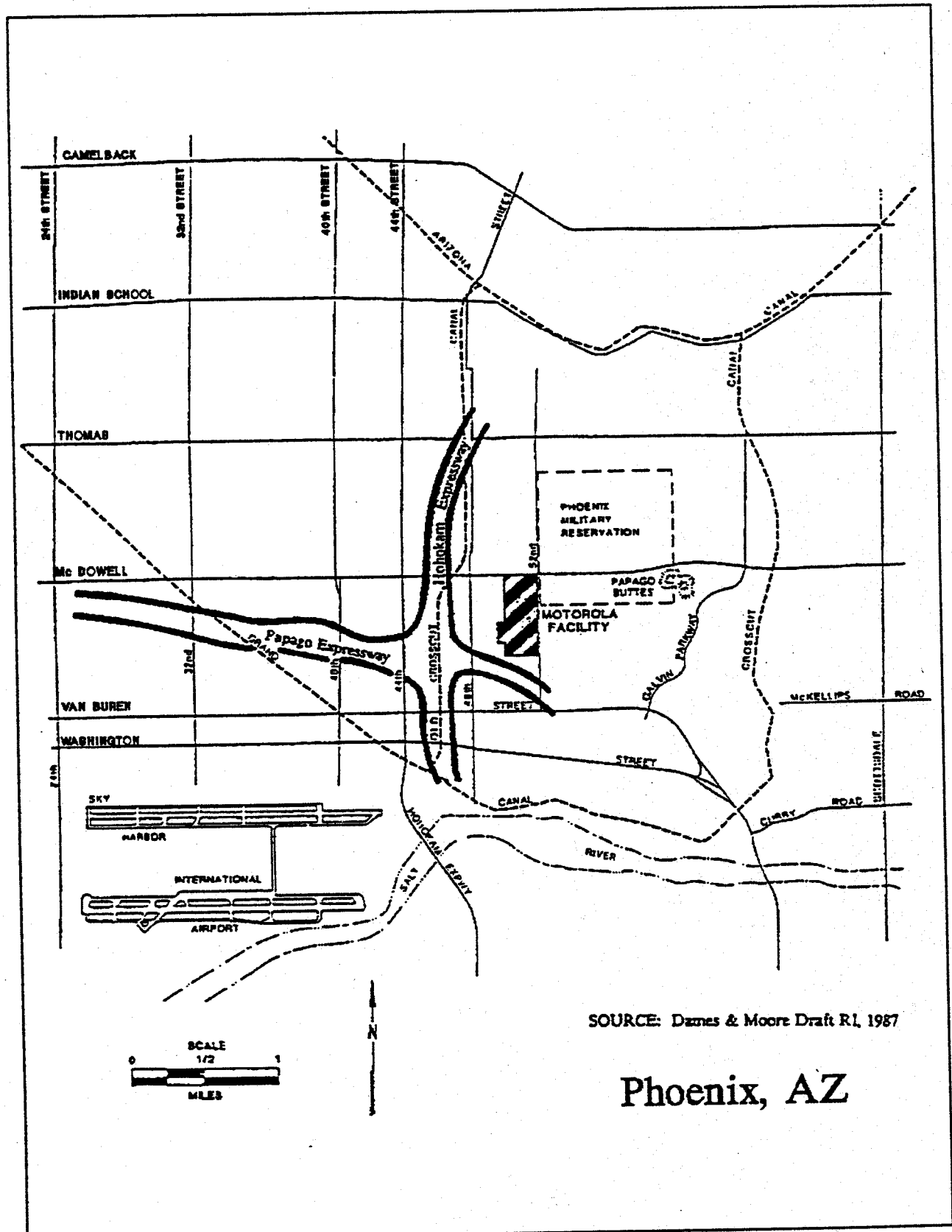


Figure 1. Site Vicinity Map



of semiconductors, for the storage of product and chemicals, and for administrative purposes. The facility also contains a reverse-osmosis/deionization plant that produces ultra-clean water for the manufacturing process, cooling towers for the facility, and large parking areas for employees. The soil vapor extraction equipment and the Integrated Groundwater Treatment Plant for treatment of extracted groundwater, constructed as part of the remedy for Operable Unit One, are also on the facility property. Figure 3 shows major buildings and features.

2. Site History and Enforcement Activities

The Motorola 52nd Street facility was originally constructed in 1956. Prior to that time, the location was largely agricultural. In 1982, Motorola discovered a solvent leak at an underground storage tank. Motorola notified the Arizona Department Of Health Services (ADHS) and initiated a Preliminary Investigation for potential soil and groundwater contamination. The report of the Preliminary Investigation, which was published on December 9, 1983, indicated soil and groundwater contamination at the plant and groundwater contamination to the west of the plant. As a result of these findings, Motorola entered into a oral agreement with EPA, ADHS and the Arizona Department of Water Resources (ADWR) to characterize the environment near the plant, identify the nature and extent of contamination and recommend remedial actions. Potential sources of contamination include past surface discharges, spills, tank and pipe leaks, and discharges to leach fields and dry wells.

Based on conservative assumptions, it is estimated that Motorola disposed of approximately 200,000 gallons of chlorinated solvents at the plant between the late 1950s and 1983. It is estimated that TCE was disposed of in the greatest quantity (116,000 gallons), followed by trichlorotrifluoromethane (57,000 gallons), and xylenes (26,000 gallons). The amount of trichloroethane (TCA) which Motorola disposed or leaked is estimated at approximately 8,000 gallons. Some toluene and tetrachloroethylene (PCE) were also disposed at the plant.

ADEQ accepted Motorola's Remedial Action Plan for Operable Unit One in a Letter of Determination on September 27, 1988. EPA's concurrence with that Letter of Determination was formalized in a Record of Decision signed on September 30, 1988. A Consent Decree was executed in July 1989 between ADEQ and Motorola for the design and implementation of the remedy for Operable Unit One. The Consent Decree also committed Motorola to additional remedial investigation and feasibility study work.

Operable Unit One (OU1) addresses organic solvents in soils and alluvium groundwater. The facilities for containment of on-plant and near-plant groundwater contamination have been in operation since May 1992. The on-plant soil vapor extraction (SVE) treatment system has been in operation since April 1992.

Three companies other than Motorola received General Notice letters in late 1992 notifying them of their potential liability at the site. These companies are AlliedSignal Corporation, ITT Cannon, and Tiernay Turbines. The City of Phoenix also received General Notice as the property owner for the AlliedSignal and ITT Cannon facilities. The locations of these facilities can be seen in Figure 2. These facilities were determined to be potentially responsible parties (PRPs) for the groundwater contamination as a result of investigations conducted under the State of Arizona's Water Quality Assurance Revolving Fund (WQARF) program.

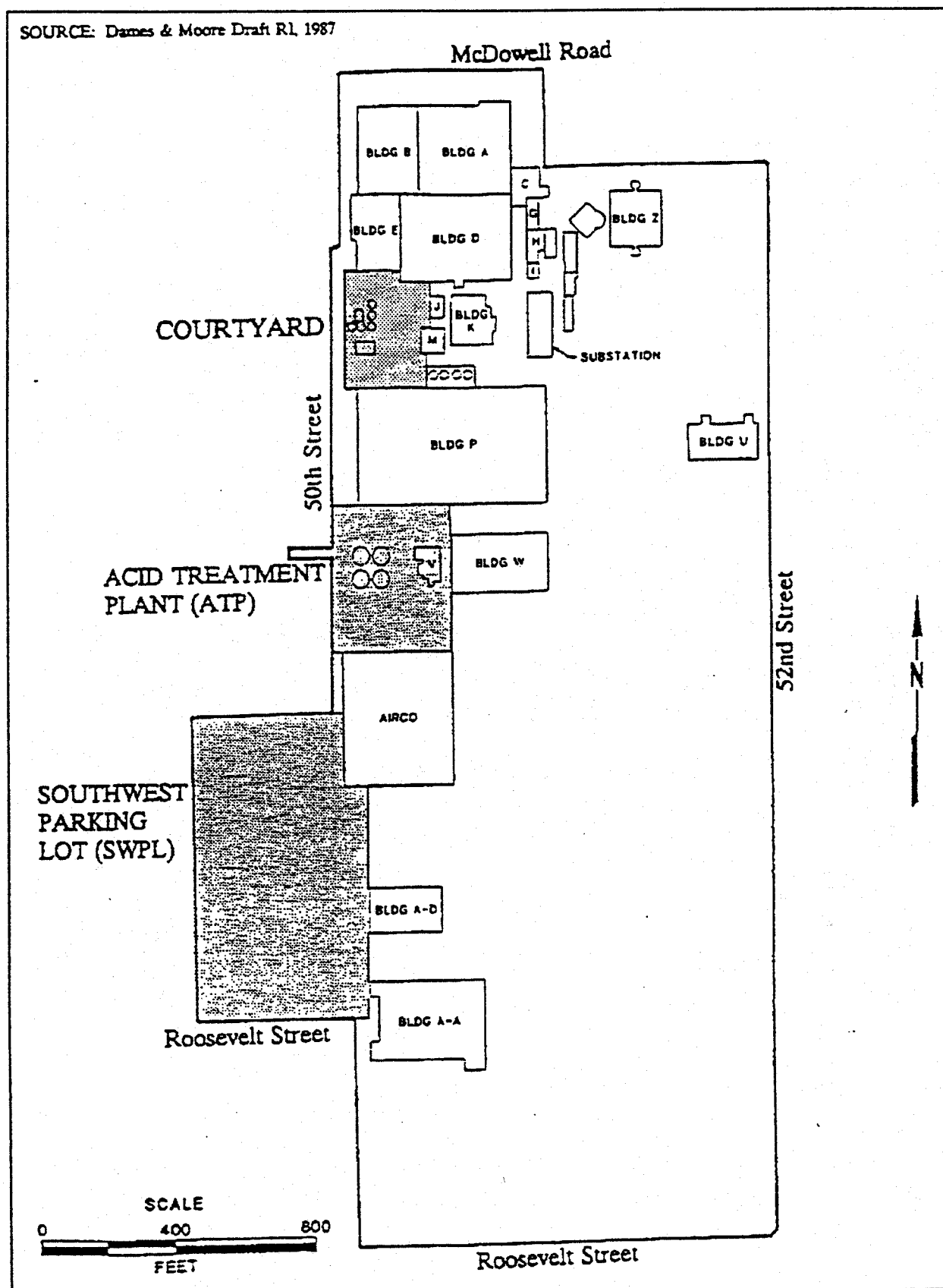


Figure 3. Motorola 52nd Street Facility Map

Volatile organic compounds (VOCs) in concentrations exceeding drinking water standards (also referred to as Maximum Contaminant Levels, or MCLs) have been detected in groundwater as far southwest as 75th Avenue and Van Buren Street. A coordinated "area sweep" groundwater quality sampling event that included the Motorola wells and wells in the East Washington WQARF investigation area took place in April, May and June, 1992. A second sweep was conducted during November and December 1992. TCE contamination has been identified by ADEQ as shown in Figure 2. The contamination extends beyond the East Washington area and into the West Van Buren WQARF area, to approximately 75th Avenue. Figure 4 shows the location of groundwater contamination projects near the Motorola 52nd Street site. In Spring of 1993, ADEQ and EPA decided to develop a second operable unit instead of a final remedy because of the extent of groundwater contamination.

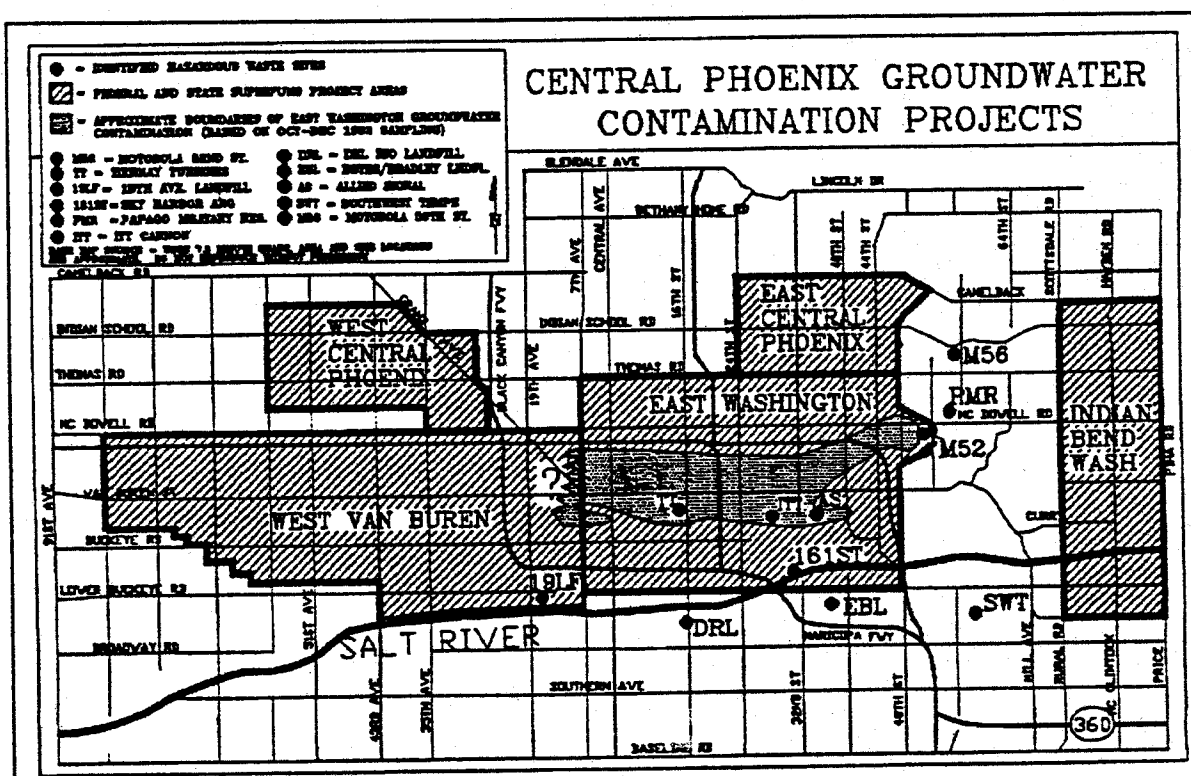


Figure 4. Area Groundwater Contamination Projects

Motorola conducted on-plant and off-plant soil gas testing in 1984 and 1985. ADEQ conducted soil gas testing in a residential area west of the Motorola 52nd Street facility in March 1992. The Arizona Department of Health Service's (ADHS) interpretation of the soil gas data concluded that the level of volatile organics in the soil gas does not present a current risk to human health. Additional soil gas sampling was done in July 1992, and results were consistent with the previous sampling data.

A Baseline Risk Assessment was completed by ADHS in November 1992. Groundwater and soil gas data were used in the assessment. Section 6 of this Record of Decision describes the risk assessment in more detail.

In October/November 1990, TCA was detected at 5100 parts per billion (ppb) in monitor well DM 201 in the Southwest Parking Lot (SWPL) area of the Motorola 52nd Street plant. Further studies, including soil gas testing and soil and groundwater investigations, revealed a separate source of contamination from the sump of the Chemix room of Building A-D. Concentrations of both TCA and 1,1 dichloroethene (DCE) in the groundwater and soil gas increased significantly in the SWPL area during the period from 1989 to 1991. Groundwater contamination extends at least 150 feet from the plant to the southwest of the parking lot, but has not been detected at well DM 733, located approximately 600 feet downgradient of the parking lot. Groundwater contamination from the SWPL area is not currently believed to merge with the larger contaminant plume. There are over 24 on-plant and off-plant wells in the SWPL monitor well network. Extraction wells have been installed along the south boundary of the parking lot. The purpose is to create a capture zone sufficient to prevent further off site migration of contaminated groundwater. Water pumped from this area is treated at the currently operating OU1 groundwater treatment plant on the Motorola plant. Wells continue to be installed to identify the extent of contamination in this area. Ongoing remedial actions in the SWPL area will be considered during development of final remedy alternatives for the Motorola 52nd Street Superfund site.

3. Community Participation

After construction of the treatment facilities for Operable Unit One, ADEQ conducted a variety of community involvement and education activities. In March 1992, when ADEQ was conducting soil gas investigations, a fact sheet was distributed to describe activities occurring at the site. During the summer of 1992, another fact sheet was distributed after the soil gas data had been evaluated by the Arizona Department of Health Services. A fact sheet was distributed during the summer of 1993 after ADEQ compiled data from this project and the East Washington Water Quality Assurance Revolving Fund project and created a series of contour maps (similar to Figure 2) outlining the immense area of apparently continuous groundwater contamination.

During most of 1992, ADEQ met regularly with a citizens' committee to discuss current activities and clarify technical issues. The meetings were held generally once a month, although the first few were more frequent. A variety of issues were discussed during these meetings, including soil gas, risk assessments, private wells, drinking water, and data requirements.

An informational meeting was held in December 1991 to discuss a variety of issues with the community. In July 1993, ADEQ held a series of open houses at several locations within the site to explain the recently-completed contaminant contour maps.

The Gateway Neighborhood Coalition has received a Technical Assistance Grant from the EPA. The grant has allowed the group to hire a technical advisor to help them understand the technical issues about the site. The technical advisor is attending meetings held by ADEQ with potentially responsible parties.

The public comment period for the Remedial Investigation/ Feasibility Study and Proposed Plan for Operable Unit Two was announced January 5, 1994 by notice in the Arizona Republic newspaper. The comment period was to extend to February 4, 1994. A timely request from

the Gateway Neighborhood Coalition caused ADEQ to extend the comment period until March 7, 1994. Notice in the Arizona Republic newspaper on February 4, 1994 and a brief fact sheet announced the extension of the comment period. Due to combined requests from Potentially Responsible Parties and the Gateway Neighborhood Coalition on February 25, 1994, the public comment period was extended a second time to April 6, 1994. Notice of this extension appeared in the Arizona Republic newspaper on March 9, 1994. Two availability sessions (Open House style meetings) were held on January 25 and 27, 1994. The public meeting to take oral and written comments was held on February 3, 1994. A response to comments received during the public comment period is included in the attached Responsiveness Summary prepared by ADEQ.

4. Scope and Role of Operable Unit Two

This is the second operable unit (OU) initiated by ADEQ to date. As part of the remedy for OU1 selected in the 1988 ROD, Motorola has begun clean-up of groundwater near the 52nd Street plant to reduce the risk from and migration of the contamination. This second OU addresses groundwater contamination in eastern Phoenix in the area west of the Old Crosscut Canal and east of Interstate 10. The available data indicate the presence of groundwater contamination in this area at levels well above drinking water standards and are sufficient to determine the approximate size and location of the needed action. ADEQ is confident the selected remedy for this OU represents a significant step toward cleanup of the area and will not be inconsistent with, or preclude implementation of, a final remedy. ADEQ has not yet selected a final remedy for the Motorola 52nd Street site, but the final remedy is expected to include, at a minimum, limiting contaminant migration in this and other highly contaminated areas of the site.

OU2 is classified as an interim action to reflect the possibility that additional remedial actions in this area may be needed. ADEQ will use information collected during operation of the selected remedy to help determine the need for additional actions and the nature of the final remedy.

The primary purpose of this response action is to establish a capture zone across the entire width and depth of the contaminant plume in the area of Interstate 10. A secondary purpose is to reduce contaminant concentrations within the alluvial aquifer upgradient of the extraction wells. Also, additional hydrogeologic data collected during this interim action will facilitate development of additional remedies. This ROD establishes additional interim measures to control the contamination. Groundwater will be extracted and treated to a level at or below Maximum Contaminant Levels (MCLs). ReInjection of the treated water will enhance hydraulic control of the plume. This interim action will be consistent with future actions, to the extent practicable.

5. Site Characteristics

The Motorola 52nd Street site contamination consists primarily of VOCs including TCE, tetrachloroethylene (PCE), trichloroethane (TCA), and associated degradation products, including vinyl chloride. Arsenic and fluoride also occur above background levels west of the Motorola plant. This area of contamination is not currently used as a source of drinking water; however, the area could potentially be used as a drinking water source.

Levels of contamination beneath the Motorola facility have been detected as high as 4,000,000 ppb of TCE. The presence of non-aqueous phase (pure product) liquids has been detected in wells on the Motorola plant. Operable Unit One is intended to contain these high levels of contaminant east of the Old Crosscut Canal at 46th Street. However, an apparently continuous area of groundwater contamination extends west-southwest to 7th Avenue and beyond (see Figure 2). The western boundary of the contaminant plume lies within the West Van Buren WQARF area and has not yet been identified. Potential releases at AlliedSignal, ITT Cannon, and Tiernay Turbines, as well as other facilities, may also be contributing to the groundwater contaminant plume that begins at the Motorola plant at 52nd Street.

The contaminants of potential concern for this operable unit are those hazardous substances that demonstrate toxic effects to human health and the environment, persist at levels above the health-based standards, and are consistently detected. The contaminants of potential concern are TCE, PCE, TCA, and their associated degradation products including vinyl chloride. Fluoride and arsenic exist near the plant above background levels, however these will not be addressed as part of this interim remedy. Inorganic contaminants will be addressed as part of the final remedy for the site. The contaminants of potential concern for this operable unit are known or suspected human carcinogens.

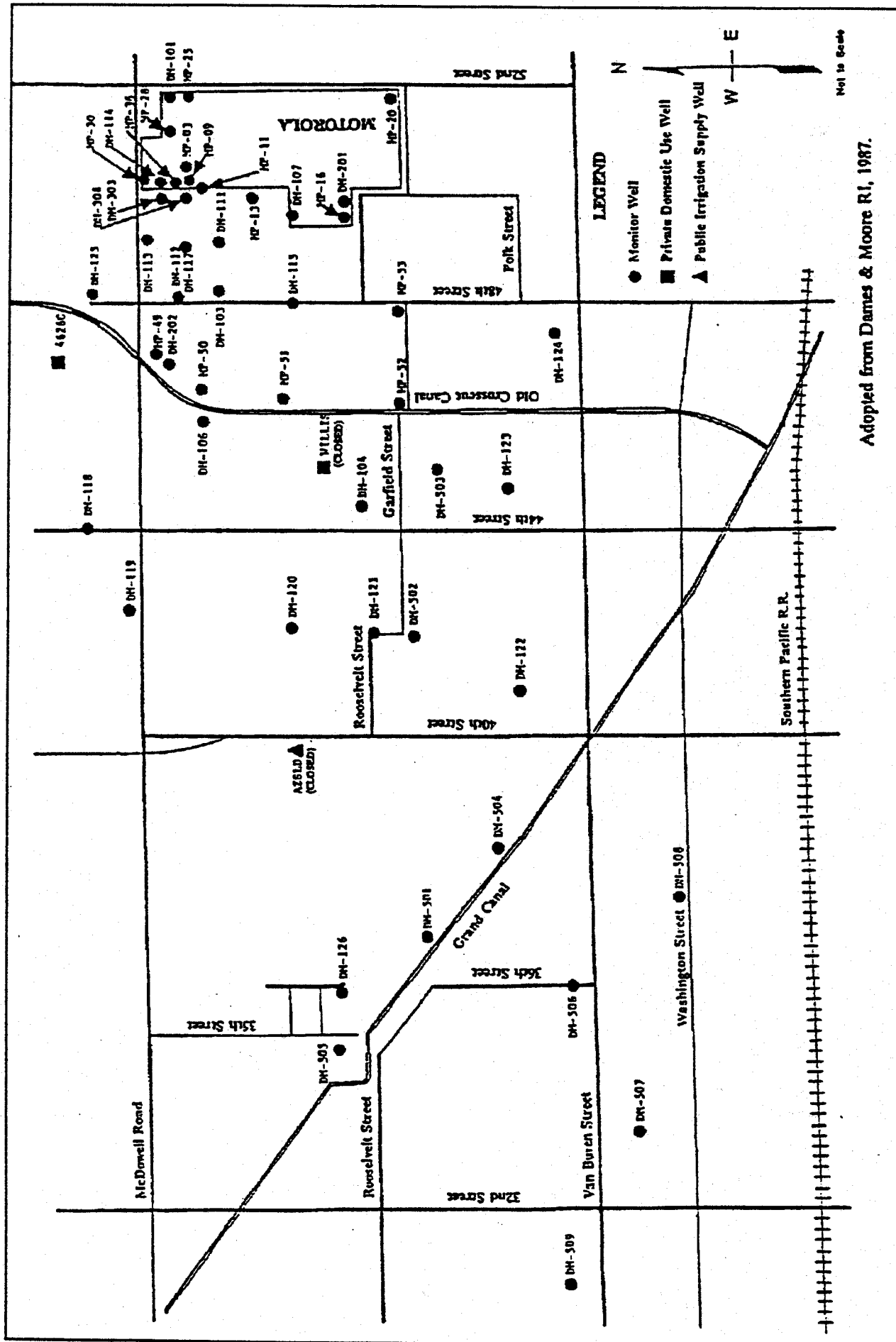
6. Summary of Site Risks

The Arizona Department of Health Services (ADHS) prepared a Baseline Risk Assessment for the Motorola 52nd Street Facility in November 1992. This Risk Assessment characterized the current and potential threats to human health assuming no action were taken to remediate the contamination. The Risk Assessment analyzed potential threats from contaminants in the groundwater, contaminants in the soils, and contaminants released from the soils. For the groundwater risk calculations, ADHS used comprehensive organic priority pollutant and inorganic chemical data from groundwater samples taken from 54 monitoring wells in alluvium and/or bedrock. Analyses of groundwater samples from soil borings which encountered groundwater were included where possible. The Risk Assessment does not include evaluation of data from wells installed and sampled since early 1992. Figure 5 shows the area studied in the Risk Assessment, and the monitor wells used.

Contaminants of potential concern

The Baseline Risk Assessment identified the compounds in Table 1 as chemicals of potential concern for the Motorola 52nd Street site, based upon review of water quality analyses from the wells. Chemicals were placed on the list if they were detected at levels greater than background levels; were considered a potential threat to human health; were detected in at least one monitor well; and the highest level detected exceeded MCLs or Health-Based Guidance Levels (HBGLs), or the chemical is a possible, probable or suspected human carcinogen.

The selected chemicals were designated "chemicals of potential concern" and were included in the computation of health risk.



Adopted from Dames & Moore RI, 1987.

Figure 5. Well Boring and Sample Locations used in the 1992 Risk Assessment

Table 1. Chemicals of Potential Concern, and range of concentrations detected

| Chemical | Min. Detected | Max. Detected |
|---|---------------|---------------|
| INORGANIC CHEMICALS (reported in parts per million) | | |
| Arsenic | 0.005 | 2.6 |
| Boron | 0.14 | 7.5 |
| Cadmium | 0.005 | 0.024 |
| Chromium (VI) | 0.07 | 0.15 |
| Chromium (total) | 0.01 | 0.24 |
| Cyanide | 0.01 | 0.21 |
| Fluoride | 0.2 | 25 |
| Lead | 0.002 | 0.08 |
| Manganese | 0.01 | 8.13 |
| Nickel | 0.02 | 0.22 |
| Nitrate | 0.37 | 92 |
| Silver | 0.1 | 0.1 |
| Sulfate | 9 | 3400 |
| Thallium | 0.0009 | 0.014 |
| Zinc | 0.01 | 2 |
| ORGANIC CHEMICALS (reported in parts per billion) | | |
| Benzene | 2.3 | 2.3 |
| Bromodichloromethane | 0.26 | 314 |
| Carbon Tetrachloride | 0.3 | 0.6 |
| Chlorobenzene | 0.3 | 1300 |
| Chloroform | 0.2 | 1500 |
| Chloromethane | 2.1 | 14 |
| Dibromochloromethane | 0.2 | 1.1 |
| 1,2-Dichlorobenzene | 0.88 | 5600 |
| 1,1-Dichloroethane | 0.09 | 1300 |
| 1,2-Dichloroethane | 0.2 | 1500 |
| 1,4-Dichlorobenzene | 36.9 | 36.9 |
| 1,2 & 1,4-Dichlorobenzene | 0.2 | 65000 |
| 1,1-Dichloroethylene | 0.3 | 26600 |
| 1,2-Dichloroethylene | 0.2 | 7000 |
| Dichloromethane | 2.7 | 170000 |
| trans-1,3-Dichloropropene | 17.9 | 17.9 |
| Tetrachloroethylene | 0.2 | 30000 |
| 1,1,1-Trichloroethane | 0.2 | 330000 |
| 1,1,2-Trichloroethane | 4 | 4 |
| Trichloroethylene | 0.2 | 4100000 |
| Vinyl Chloride | 1.4 | 20000 |

A review of water quality data from wells that were included in the January 1993 Quarterly Report prepared by Motorola shows no additional compounds above MCLs or HBGLs in the expanded well area.

Exposure Assessment

The second step of the Risk Assessment identified possible exposure pathways. An exposure pathway is considered complete when a chemical of concern contacts a receptor (person). In the Baseline Risk Assessment for the Motorola 52nd Street site, potentially exposed populations are residents living near the facility and workers at the facility. ADHS determined that the possible exposure pathways include ingestion, inhalation, and dermal contact with contaminated groundwater, and inhalation of vapors from soils.

Currently, there are no private or public drinking water wells supplying drinking water from the known area of groundwater contamination. One private well northwest of the facility, 4626G, has been used for filling a swimming pool and residential irrigation. Well 4626G was also reportedly used for indoor domestic use for approximately six months during 1989 to 1990. One irrigation well, SRP well 18E-5N, periodically supplements water in the Grand Canal with groundwater from the area. Groundwater quality data for 54 wells sampled throughout the area between 1988 and 1991 were used to calculate potential exposure concentrations from groundwater. Table 1 shows the range of concentrations detected in wells tested during this period for the chemicals of potential concern.

Vadose zone remediation is not a goal of this interim action, and therefore exposures to contaminated soils or soil gas are not addressed in detail in this summary of site risks. Potential exposure to soil gas vapors was calculated for three groups: on-site outdoor workers; on-site indoor workers; and area residents. The potential for health effects to nearby residents through exposure to soils or soil vapors was determined to be insignificant.

The Risk Assessment calculated the average and the reasonable maximum exposures by ingestion or inhalation of the contaminants. Major exposure assumptions are summarized in Table 2.

Toxicity Assessment

The next step of the Risk Assessment was to determine the carcinogenic and non-carcinogenic toxicity of the contaminants of potential concern. Risk was calculated differently for carcinogenic and non-carcinogenic risks.

Carcinogenic Effects

EPA's Carcinogenic Assessment Group developed cancer potency factors (CPFs), also called Slope Factors, to estimate excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Slope Factors (SF), which are expressed in units of $(\text{mg}/\text{kg}\cdot\text{day})^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in $\text{mg}/\text{kg}\cdot\text{day}$, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes under-estimation of the actual cancer risk highly unlikely.

Table 2. Major Exposure Assumptions in Risk Calculations

| Exposure Factors | | |
|---------------------------------------|----------------------|---------------------|
| parameter | Intake value (adult) | |
| | average | reasonable maximum |
| Body Weight | 70 kilograms | 70 kilograms |
| Years in lifetime* | 70 years | 70 years |
| Ingestion rate (water) | 2 liters/day | 2 liters/day |
| Inhalation rate (air) | 20 cubic meters/day | 20 cubic meters/day |
| Groundwater | | |
| Exposure frequency | 350 days/year | 350 days/year |
| Exposure duration* | 9 years | 30 years |
| Occupational air (indoor and outdoor) | | |
| Exposure time | 4 hours/day | 8 hours/day |
| Exposure frequency | 250 days/year | 250 days/year |
| Exposure duration* | 9 years | 30 years |
| Residential Air (outdoor) | | |
| Exposure time | 2 hours/day | 8 hours/day |
| Exposure frequency | 350 days/year | 350 days/year |
| Exposure duration* | 9 years | 30 years |
| Residential Air (indoor) | | |
| Exposure time | 16 hours/day | 24 hours/day |
| Exposure frequency | 350 days/year | 350 days/year |
| Exposure duration* | 9 years | 30 years |

* Carcinogenic effects are averaged over a 70 year lifetime, while non-carcinogenic effects are averaged over the exposure duration listed in the table.

Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Slope factors were obtained from EPA's on-line Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables databases.

Non-Carcinogenic Effects

EPA developed reference doses (RfDs) for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals, who are likely to be without an appreciable risk of deleterious effects during a lifetime. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans).

Risk Characterization

Risks, both current and potential, are characterized and evaluated utilizing exposure and toxicology information. Risk characterization is presented in both quantitative and/or qualitative format. When data are available, quantitative risk characterizations are performed and evaluated qualitatively. Risk estimation methods used in the risk assessment proceed from estimation for a single compound and exposure route, to a summation of risk for all chemicals of concern for a given route, and culminating with a summation of risk across exposure routes.

Carcinogenic risk is calculated as the incremental probability of an individual developing cancer over a lifetime (70 years) due to exposure to a carcinogenic compound. This is also referred to as incremental or excess lifetime cancer risk (ELCR) and represents the increased risk of developing cancer above the background rate, estimated at about 3×10^{-1} (30%). Non-carcinogenic effects include neurotoxic, hepatotoxic, nephrotoxic, teratogenic, and reproductive reactions, and any other noncancer related systemic toxic responses. The potential for an individual suffering a noncarcinogenic effect is not expressed as a probability, but as a ratio or quotient. The hazard index is the ratio of an exposure level over a specified period (CDI) to the chemical specific reference dose (RfD) which is not expected to produce toxic effects over the period of concern.

A well-by-well approach was taken due to the large area covered by the monitor wells and the large differences in concentrations of chemicals over that area. The potential ingestion risk, cancer hazard index, and systemic hazard index were calculated for each chemical of concern, on a well-by-well basis. A well total for each category was determined by summing the entries. Table 3 presents the range of calculated potential ELCR and non-cancer hazard indices under average and reasonable maximum exposures.

Table 3. Range of calculated potential ELCR and non-cancer hazard indices under average and reasonable maximum exposures

| | <u>Average Exposure</u> | | <u>Reasonable max. exposure</u> | |
|--------------|-----------------------------------|---|-----------------------------------|----------------------------------|
| | minimum | maximum | minimum | maximum |
| ELCR | 8×10^{-7} (well DM123) | 1×10^{-2} (wells DM117 & MP11) | 3×10^{-6} (well DM123) | 7×10^{-2} (well MP03) |
| Hazard Index | 2.9×10^{-3} (well DM123) | $3.7 \times 10^{+2}$ (well MP03) | 2.9×10^{-3} (well DM123) | $8.2 \times 10^{+2}$ (well MP03) |

The Baseline Risk Assessment for this site demonstrates that potential risk from exposure to contaminated groundwater is greater than the 1×10^{-4} , or one-in-ten-thousand, upper limit of the generally acceptable risk range specified in the National Contingency Plan. This is true for areas upgradient and downgradient of the current containment line of Operable Unit One. Therefore, additional groundwater remedies are necessary at this site.

Environmental Risk

An Ecological Risk Assessment performed by EPA in April 1993 concludes that no threatened or endangered species have been verified in the vicinity of the Motorola 52nd Street facility. Two wells used for irrigation, domestic well 4626G and Salt River Project (SRP) well 18E-5N, may potentially expose plants and animals to contaminants in groundwater. The average concentration of TCE detected in well 4626G is 0.3 ppb, with the highest detection being 0.7 ppb. Water from the SRP well is diluted as it is discharged into the canal system by a factor of 59 in the winter and 294 during the summer. VOCs have not been detected in this well.

Groundwater may also be encountered in the Old Crosscut Canal at approximately Oak Street, where a spring seep occurs. Model predictions estimate contaminant concentrations in groundwater at this point to be approximately 10 ppb of VOCs, which would be diluted due to flows in the canal.

Summary

All risk estimates in the Risk Assessment were based on a number of assumptions regarding contaminant concentrations and fate, exposures, doses, and toxicity information. ADHS took care at each step to ensure that assumptions and estimates were representative of upper bounds. True risk may be much less than calculated. This was done purposely to be protective of public health.

The conclusion of the Risk Assessment and the Remedial Investigation/Feasibility Study is that releases of hazardous substances from this site present an imminent and substantial endangerment to public health, welfare, and the environment in the absence of any remedial action. Response

action to date has reduced site risk, but groundwater contamination at the site still exceeds Maximum Contaminant Levels and warrants additional remedial action.

7. Description of Alternatives

The specific objectives for the interim remedial action in Operable Unit Two are to establish a capture zone across the entire width and depth of the contaminant plume, and to begin to remove contaminants from the groundwater for eventual restoration of the aquifer as a potential source of drinking water. The remedy for OU2 is an interim action. Accordingly, the remedy does not include aquifer remediation standards or a restoration timeframe. A final remedy for the entire Motorola 52nd Street site will be developed after further investigation to define the extent of groundwater contamination.

The Interim Remedy Feasibility Study (IRFS) for Operable Unit Two, and the supplement to the IRFS, evaluated seven alternatives. These alternatives are briefly described below. The alternatives are further briefly explained in the "Proposed Plan for the Motorola 52nd Street Superfund Site" completed by ADEQ in January 1994.

No Action Alternative

The Superfund program requires that a "No Action" alternative be evaluated at every site as a baseline for comparison of other cleanup alternatives. Under this alternative, no further action (beyond continued operation of the existing OU1 containment system) would be taken to limit migration of contaminated groundwater. Five additional monitoring wells would be installed to define and monitor the extent of groundwater contamination downgradient of OU1. The monitoring program would include water level measurements and analysis of water samples on a quarterly basis.

Costs associated with the No Action alternative are considered base costs and thus no comparison is made with other alternatives.

Alternatives 11, 11C, 21, 64R, and 64C

The numbers describing the alternatives in this Record of Decision are consistent with those used in the Interim Remedy Feasibility Study, the IRFS supplement, and the Proposed Plan to allow easy reference to those documents. Charts describing these alternatives appear underneath Figure 6 and in Table 4.

The five alternatives described below all include groundwater extraction, treatment of extracted water, disposal of treated water via a beneficial end use, and the installation of additional monitoring wells. Each of the alternatives was developed and evaluated assuming continued operation of the existing OU1 groundwater containment system. Treatment of the extracted groundwater for removal of VOCs will be accomplished using either air stripping (with treatment of air emissions and off-site incineration of recovered solvents) or advanced oxidation (which uses ultraviolet light to destroy VOCs). These two technologies are discussed in detail in the IRFS. Both are considered to be established, reliable technologies for removal of the VOCs of

concern at this site. Depending on location of the treatment plant, each has advantages over the other. Selection of the preferred technology will therefore be made during remedial design. For the purpose of calculating the costs of each alternative, it was assumed that air stripping would be the selected technology for VOC removal.

The differences between the alternatives are mainly 1) the location where groundwater extraction would take place and 2) what the beneficial use of the treated water would be. The amount of contaminants removed over time also differs between alternatives. A computer model was used to determine the pumping rates that would result in effective capture of the plume at each alternative location. Figure 6 shows the general location of the line of extraction wells for each of the alternatives and the resulting capture zone.

The IRFS also includes a detailed description and evaluation of alternative 64, in which groundwater would be extracted near Interstate 10, treated for VOCs and discharged to an existing stormwater drain leading to the Salt River. This discharge option was subsequently determined to be inconsistent with the requirement for beneficial end use, and the alternative was eliminated from further consideration.

Alternative 11 - Extraction at the Grand Canal, treatment for VOCs and Fluoride, and ReInjection

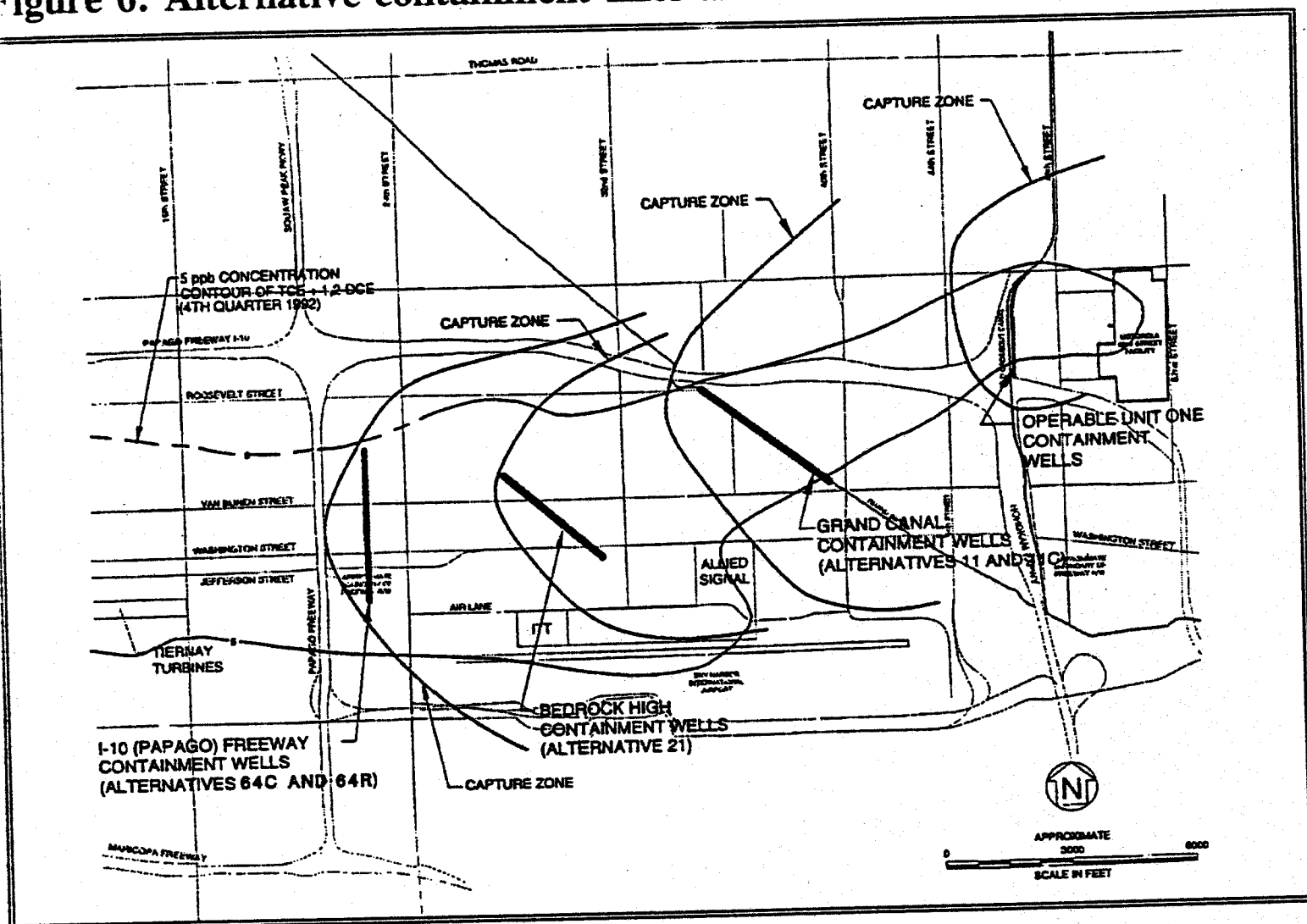
This alternative would provide containment of contaminated groundwater in the area of the Grand Canal. Extraction wells would be located along the east side of the Grand Canal and injection wells would be located east of the Grand Canal. Some injection wells would be located along the north and south edges of the plume to keep contaminants from moving in those directions, and others would be located in the central portion of the plume.

Groundwater would be extracted at a rate of approximately 2800 gallons per minute and treated for VOCs and fluoride to meet drinking water standards. Fluoride would be removed from the water using activated alumina adsorption, in order to meet treatment standards for reinjection. The calcium fluoride sludge generated by the activated alumina process would be disposed of in a landfill.

The capture zone would contain approximately 0.7 additional square miles of the contaminant plume beyond OU1. The treatment system would remove approximately 800 gallons of TCE from the aquifer over a 20 year period. (Gallons of TCE removed is supplied for comparison purposes. Other VOCs would also be removed.) The capture zone (see Figure 5) will be achieved within one year of system start-up.

Capital costs for this alternative are estimated to be \$11,950,000 and annual operation and maintenance (O&M) costs are \$2,450,000. The present value is calculated to be \$40,000,000. A large part of this cost is associated with the fluoride treatment technology (approximately 25% of capital costs and 45% of annual O&M costs).

Figure 6. Alternative containment lines and features



| | NO ACTION | ALTERNATIVE 11 Extraction at Grand Canal, reinjection | ALTERNATIVE 11C Extraction at Grand Canal, discharge to Grand Canal | ALTERNATIVE 21 Extraction at Bedrock High, reinjection | ALTERNATIVE 64C Extraction at Papago Freeway, discharge to Grand Canal | ALTERNATIVE 64R Extraction at Papago Freeway, reinjection |
|--|---|--|--|---|---|--|
| Estimated No. of New Wells | 5 - monitoring ¹ | 4 - extraction 12 - injection 7 - monitoring | 4 - extraction 7 - monitoring | 8 - extraction 9 - injection 7 - monitoring | 2 - extraction 8 - monitoring | 2 - extraction 15 - injection 8 - monitoring |
| Treatment Capacity | no additional capacity | 2800 gallons per minute | 2800 gallons per minute | 1900 gallons per minute | 4000 gallons per minute | 4000 gallons per minute |
| Overall Protectiveness | No additional containment | 0.7 square mile containment area | 0.7 square mile containment area | 1.5 square mile containment area | 2.6 square mile containment area | 2.6 square mile containment area |
| Contaminants Treated | | VOCs and fluoride | VOCs | VOCs | VOCs | VOCs |
| Reduction of Toxicity, Mobility, or Volume through Treatment | 250 gallons of TCE removed by OU1 in 20 years | 800 gallons of TCE removed in 20 years | 850 gallons of TCE removed in 20 years | 1350 gallons of TCE removed in 20 years | 2250 gallons of TCE removed in 20 years | 2000 gallons of TCE removed in 20 years |
| 20-year cost (present value) | base costs ² | \$40,000,000 ³ | \$19,000,000 | \$21,000,000 | \$28,000,000 | \$31,000,000 |

¹ Number of monitor wells for No Action are part of, not in addition to, those listed for the remaining alternatives.

² Elements of the No Action Alternative are constant for all alternatives, other costs listed are above and beyond these costs.

³ Treatment of fluoride in Alternative 11 is a large portion of the cost.

Alternative 11C - Extraction at Grand Canal, Treatment for VOCs, and Discharge to the Grand Canal

This alternative is similar to Alternative 11. Extracted water would be treated for VOCs only, and the treated water would be discharged into the Grand Canal for irrigation use instead of being injected back into the ground. No treatment for fluoride would be conducted because fluoride concentrations in extracted groundwater would not exceed standards applicable to irrigation water.

The capture zone would contain approximately 0.7 additional square miles of the contaminant plume, and remove approximately 850 gallons of TCE from the aquifer over a 20 year period. (Gallons of TCE removed is supplied for comparison purposes. Other VOCs would be also be removed.) The capture zone (see Figure 6) will be achieved within one year of system start-up. For approximately one month every year, discharge to the Grand Canal will not be allowed while the canal is drained for maintenance. During this period, containment, primarily along the peripheries of the capture zone, will be lost. If the effects of the one-month shutdown on maintaining containment are unacceptable, alternatives (such as reinjection) are available to allow the extraction system to continue to operate. However, the additional costs of such discharge alternatives are not included in the cost figures described below.

Capital costs for this alternative are estimated to be \$3,780,000 and annual operation and maintenance costs are \$1,260,000. The present value is calculated to be \$19,000,000.

Alternative 21 - Extraction at the Bedrock High, Treatment for VOCs, and Reinjection

An area of elevated bedrock, referred to in the Interim Remedy Feasibility Study as a Bedrock High, exists oriented southeast to northwest near 32nd Street and Washington. The location is near the proposed location of extraction wells seen in Figure 6. This alternative is designed to make use of this geologic feature to aid the containment of the contaminants. Groundwater extraction would occur near the Bedrock High, and injection of the treated water would occur east of the Bedrock High. Some of the injection wells would be along the northern edge of the plume to keep the plume from moving in that direction, and others would be in the central portion of the plume. The extracted water would be treated for VOCs to meet drinking water standards. Inorganics in this extraction area do not occur at levels that would require treatment before reinjection or discharge to surface water.

Additional information regarding the bedrock high was collected by Motorola after completion of the Interim Remedy Feasibility Study. This information indicates that the effectiveness of Alternative 21, as configured in the feasibility study, would be dramatically reduced.

The extraction and treatment system would contain approximately 1.5 additional square miles of the contaminant plume and remove approximately 1350 gallons of TCE from the aquifer over a 20 year period. (Gallons of TCE removed is supplied for comparison purposes. Other VOCs would also be removed.) The capture zone (see Figure 5) will be achieved within one year of system start-up.

Capital costs for this alternative are estimated to be \$7,000,000 and annual operation and maintenance costs are \$1,160,000. The present value is calculated to be \$21,000,000.

Alternative 64R - Extraction near I-10, Treatment for VOCs, and Reinjection

This location for a containment line represents the western edge of the area originally studied for a final remedy. There is sufficient hydrogeologic characterization to support remedial actions up to Interstate 10. Extraction wells would be located near Interstate 10. The extracted water would be treated for VOCs to meet drinking water standards. Inorganics in this extraction area do not occur at levels that would require treatment before the beneficial use. The treated water would be injected back into the ground. Some of the injection wells would be located east of Interstate 10 at the northern edge of the plume to keep contaminants from moving in that direction, and others would be in the central portion of the plume.

The extraction and treatment system would contain approximately 2.6 additional square miles of the contaminant plume and remove approximately 2000 gallons of TCE from the aquifer over a 20 year period. (Gallons of TCE removed is supplied for comparison purposes. Other VOCs would also be removed.) The capture zone (see Figure 5) will be achieved within one year of system start-up.

Capital costs for this alternative are estimated to be \$9,160,000 and annual operation and maintenance costs are \$1,770,000. The present value is calculated to be \$31,000,000.

Alternative 64C - Extraction near I-10, Treatment for VOCs, and Discharge to the Grand Canal

Alternative 64C was developed in the Supplement to Interim Remedy Feasibility Study report to present another beneficial end-use for this extraction location. This alternative is similar to Alternative 64R, however treated water would be piped to the Grand Canal for irrigation use. Extraction wells would be located near Interstate 10. The extracted water would be treated for VOCs to meet drinking water standards. Inorganics in this extraction area do not occur at levels that would require treatment before the beneficial use.

The extraction and treatment system would contain approximately 2.6 additional square miles of the contaminant plume and remove approximately 2250 gallons of TCE from the aquifer over a 20 year period. (Gallons of TCE removed is supplied for comparison purposes. Other VOCs would also be removed.) The capture zone (see Figure 5) will be achieved within one year of system start-up. As is the case with Alternative 11C, discharge to the Grand Canal will be interrupted for approximately one month every year. Similar alternatives exist to allow continued operation of the extraction system, although the additional costs of such discharge alternatives are not included in the cost figures below.

Capital costs for this alternative are estimated to be \$7,390,000 and annual operation and maintenance costs are \$1,640,000. The present value is calculated to be \$28,000,000.

8. Summary of Comparative Analysis of Alternatives

ADEQ and EPA analyzed and compared the remedial alternatives developed in the Interim Remedy Feasibility Study and IRFS supplement based on the nine criteria in the National Contingency Plan. This section presents a summary of that comparative analysis of alternatives. The discussion below is summarized in Table 4.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls or institutional controls. Overall protection of human health and the environment and compliance with ARARs, which is addressed below, are the two "threshold criteria" that must be met for an alternative to be deemed acceptable.

All of the alternatives, except No Action, provide some degree of protection of human health and the environment without substantial negative impacts. Risk is reduced by removing contaminants from the environment, and inhibiting their westward migration. Alternatives 64C and 64R provide the largest area of containment (2.6 square miles of the plume) and also contain the largest mass of contaminants. Alternative 21 provides the next highest degree of containment (1.5 square miles), and Alternatives 11 and 11C provide the lowest degree of containment (0.7 square miles) relative to the other Alternatives. The difference between reinjection and discharge to the canal is not significant in terms of protection of human health. Negative impacts associated with the alternatives include the disruption that would result from installation of pipelines and other components of the remedy, and the impacts of handling, treating and disposing of residuals (e.g., air emissions and recovered solvents).

As this is an interim remedy, additional future actions may be required to reduce site-wide risks to an acceptable level.

The ecological risks from groundwater contamination within OU2 are not expected to be significant for the reasons stated in Section 6.

Compliance with ARARs

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) addresses whether a remedy will comply with Federal and State environmental laws and regulations that either apply to or are relevant and appropriate for the action being taken. All of the alternatives will comply with their respective ARARs. Cleanup of the aquifer to drinking water standards is not an ARAR because it is beyond the scope of this interim action for OU2. No ARARs waivers are expected to be needed.

Long-term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time. This criterion includes the consideration of residual risk and the adequacy and reliability of any controls.

TABLE 4. COMPARISON OF ALTERNATIVES

| Criteria | No Action | 11 Pump at Grand Canal & Reinject (Fluoride removal) | 11C Pump at Grand Canal & discharge to canal | 21 Pump at Bedrock High & Reinject | 64C Pump at I-10 & discharge to Grand Canal | 64R Pump at I-10 & Reinject |
|--|---|---|---|---|---|---|
| Overall Protection of Human Health & Environment | Will not prevent further downgradient and vertical migration of contaminated groundwater | Some reduction of risk by reducing contaminant mass through treatment of extracted water. Untreated contaminant mass downgradient of the capture zone is high relative to 21, 64C or 64R. | Some reduction of risk by reducing contaminant mass through treatment of extracted water. Untreated contaminant mass downgradient of the capture zone is high relative to 21, 64C or 64R. | Some reduction of risk by reducing contaminant mass through treatment of extracted water. Untreated contaminant mass downgradient of the capture zone is higher than with 64C or 64R. | Some reduction of risk by reducing contaminant mass through treatment of extracted water. Untreated contaminant mass downgradient of the capture zone is low relative to 11, 11C or 21. | Some reduction of risk by reducing contaminant mass through treatment of extracted water. Untreated contaminant mass downgradient of the capture zone is low relative to 11, 11C or 21. |
| ARARs Compliance | yes | yes | yes | yes | yes | yes |
| Long-term Effectiveness | | Least effective based on area contained & VOC mass removed. | Least effective based on area contained & VOC mass removed. | More effective based on area contained & VOC mass removed. | Most effective based on area contained & VOC mass removed. | Most effective based on area contained & VOC mass removed. |
| Reduction of Toxicity, Mobility or Volume (TMV) Through Treatment | No reduction | Effectively destroys VOCs removed. Fluoride removed is disposed in landfill. Smallest containment area and lowest VOC mass removal. | Effectively destroys VOCs removed. Smallest containment area and lowest VOC mass removal. Intermittent canal availability. | Effectively destroys VOCs removed. Larger containment area than 11/11C and higher VOC mass removal. | Effectively destroys VOCs removed. Largest containment area and highest VOC mass removal. Intermittent canal availability. | Effectively destroys VOCs removed. Largest containment area and highest VOC mass removal. |
| Total capture area: | | 0.7 sq miles | 0.7 sq miles | 1.5 sq miles | 2.6 sq miles | 2.6 sq miles |
| Initial Rate of VOC Removal: | | 7.7 lbs/day | 7.7 lbs/day | 10.4 lbs/day | 25.9 lbs/day | 25.9 lbs/day |

| Criteria | No Action | II Pump at Grand Canal & Reinject (Fluoride removal) | IIIC Pump at Grand Canal & discharge to canal | 2I Pump at Bedrock High & Reinject | 64C Pump at I-10 & discharge to Grand Canal | 64R Pump at I-10 & Reinject |
|--|---------------|--|--|---|---|--|
| Short-term Effectiveness | | Capture zone established within one year of startup. Potential VOC air emissions of 0.9 lbs/day. Moderate traffic disruptions during construction. Highest potential worker exposure to treatment chemicals. | Capture zone established within one year of startup. Potential VOC air emissions of 0.9 lbs/day. No traffic disruptions during construction. Low potential for worker exposure to treatment chemicals. | Capture zone established within one year of startup. Potential VOC air emissions of 1.2 lbs/day. Moderate traffic disruptions during construction. Lowest potential worker exposure to treatment chemicals. | Capture zone established within one year of startup. Potential VOC air emissions of 2.9 lbs/day. Minimal traffic disruptions during construction. Low potential for worker exposure to treatment chemicals. | Capture zone established within one year of startup. Potential VOC air emissions of 2.9 lbs/day. Highest level of traffic disruptions during construction. Low potential for worker exposure to treatment chemicals. |
| Implementability | | Technical feasibility is high. Administrative feasibility is moderate based on number of wells and length of pipelines. | Technical feasibility is high. Administrative feasibility is highest based on number of wells and length of pipelines. | Technical feasibility is moderate due to uncertainties regarding impact of bedrock high on extraction. Administrative feasibility is moderately high based on number of wells and length of pipelines. | Technical feasibility is moderately high based on the extent of hydro-geologic characterization. Administrative feasibility is high based on number of wells and length of pipelines. | Technical feasibility is moderately high based on the extent of hydro-geologic characterization. Administrative feasibility is moderate based on number of wells and length of pipelines. |
| Cost (in \$000): Capital : O&M : Present Value: | 0 0 \$0 | 11,950 2,450 \$40,000 | 3,780 1,260 \$19,000 | 7,000 1,160 \$21,000 | 7,390 1,640 \$28,000 | 9,160 1,770 \$31,000 |

| Criteria | No Action | 11 Pump at Grand Canal & Reinject (Fluoride removal) | 11C Pump at Grand Canal & discharge to canal | 21 Pump at Bedrock High & Reinject | 64C Pump near I-10 & discharge to Grand Canal | 64R Pump near I-10 & Reinfect |
|----------------------|------------|---|--|---|--|--|
| State Acceptance | | | | | | ADEQ prefers this alternative. |
| Community Acceptance | No support | Several commentors preferred this alternative. Others supported this alternative in combination with 64R. | One commentor noted that discharges to the canal would not be possible year-round. | No commentors supported this alternative. | One commentor preferred this alternative over 64R. One commentor noted that discharges to the canal would not be possible year-round. Several commentors opposed this extraction location due to potential adverse impacts on other sources of contamination and incomplete hydrogeologic characterization of the entire capture zone. | Several commentors opposed this extraction location due to potential adverse impacts on other sources of contamination and incomplete hydrogeologic characterization of the entire capture zone. |

As this is an interim remedy, long-term effectiveness is not a critical factor; however, this interim action, in conjunction with other actions, will contribute to long-term effective control of groundwater contamination. Each of the alternatives should be effective in capturing contaminated groundwater with its containment area. The magnitude of risk remaining is a function of the extent of contamination within OU2 that is not captured by a given alternative. Thus, for example, because Alternatives 64C and 64R have the largest capture zone, these alternatives would minimize the magnitude of remaining risk. A final remedy for the site is expected to be identified within five years of this Record of Decision.

Reduction of Toxicity, Mobility or Volume Through Treatment

Reduction of toxicity, mobility or volume refers to the preference for a remedy that uses treatment to reduce health hazards, contaminant migration, or the quantity of contaminants at the site.

All of the alternatives, except No Action, use permanent destruction as the primary element to address the principal threat of contamination. Groundwater treatment alternatives include activated alumina adsorption for inorganics and either air stripping or advanced oxidation for VOCs. Advanced oxidation would destroy VOCs at the treatment plant, while off-site incineration of captured VOCs would be used in conjunction with air stripping. Inorganics (primarily fluoride) removed in Alternative 11 would be precipitated in the form of calcium fluoride and disposed of in a landfill, thereby reducing the volume of fluoride-contaminated media and its mobility, although the fluoride itself would not be destroyed.

The alternatives differ substantially in terms of the VOC contaminant mass contained within their capture zones and in the initial rate of VOC removal. Alternatives 64C and 64R have the largest containment areas and the highest rates of VOC removal (approximately 26 lbs/day), while Alternatives 11 and 11C have the smallest containment areas and lowest VOC removal rates (approximately 8 lbs/day). Alternative 21 was estimated to have a containment area about twice the size of Alternatives 11 and 11C but a VOC removal rate (10.4 lbs/day) that was only 25% higher than 11 or 11C. Estimates of TCE removed, as listed in the IRFS, for alternatives including reinjection of treated water (Alternatives 11 and 64R) are slightly lower than estimates for their counterparts including discharge of treated water to the Grand Canal (Alternatives 11C and 64C) due to the effects of injecting water treated for VOCs upgradient of the extraction wells.

Short-term Effectiveness

Short-term effectiveness refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy. The following were used to evaluate the short-term effectiveness of each alternative: protection of the community and workers during remedial actions; environmental impacts from implementation of alternatives; and the length of time until remedial objectives are met.

In this interim remedy, additional capture of contaminated groundwater is a primary objective.

All of the alternatives, except No Action, would achieve this objective within one year of system startup, although the plume area and contaminant mass captured varies significantly among alternatives. For each alternative, the treatment plant would have air emission controls to reduce VOC emissions below the allowable maximum (unless advanced oxidation is used, in which case emission controls are not needed). These controlled air emissions would range from approximately 0.9 lbs/day for alternatives 11 and 11C to 2.9 lbs/day for alternatives 64C and 64R.

Soil contamination is not expected where construction would occur for any of the alternatives, however safety risks associated with construction activities would temporarily affect the community. The degree of this safety risk varies with the quantity and type of facilities required by each alternative. Traffic disruptions would be caused during well and pipeline installation. Alternative 11C would cause no traffic disruption. Alternative 64C would require 5 street crossings and 14,650 feet of piping in rights-of-way. Alternatives 21 and 11 are similar in requiring 8 street crossings each and 22,900 and 29,400 feet of piping, respectively, in rights-of-way. The most disruptive alternative is 64R, with 19 street crossings and 24,500 feet of piping in rights-of-way.

Under Alternative 21, workers operating and maintaining remedial facilities would have the least potential exposure to recovered solvents and treatment chemicals. Alternative 11C would cause the next least potential exposure. Alternatives 64R and 64C would have similar potential for exposure after Alternative 11C, and Alternative 11 would have the most potential. Treatment chemicals include acids and caustics, biocide, and lime.

Implementability

Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the selected remedy. It also includes coordination of Federal, State and local governments to clean-up the site.

Factors evaluated to determine technical feasibility include unknowns associated with construction and operation of a technology, reliability, level of hydrogeologic characterization, and ease of supplementing the remedy, if necessary. All of the technologies incorporated in the alternatives are reliable and effective for treating the target contaminants. Hydrogeologic characterization is highest in the area of Alternatives 11 and 11C, where the density of data is higher. Hydrogeologic data density is lower in the area of Alternatives 64C and 64R. The incomplete characterization of the bedrock high results in a limited understanding of hydrogeology in the area of Alternative 21. The reliability of Alternatives 64C and 64R is less certain than 11 and 11C because of the potential for uncharacterized/unknown sources to contribute contaminants that are incompatible with the treatment system. Each alternative would allow additional remedial actions to be taken, except that enhancements to reinjection (such as stimulation of *in situ* bioremediation of groundwater) are not readily implementable in Alternatives 11C and 64C, which do not include reinjection wells.

Administrative feasibility is a function of the need to coordinate with other agencies and of the amount of facilities required by each alternative that will be subject to approvals and permitting requirements. For this interim action, the most significant factors are the lengths of pipeline and

number of wells to be installed. On this basis, Alternative 11C would have the highest ranking for administrative feasibility, 64C would rank second, and the remaining alternatives would all rank significantly lower.

Cost

This criterion examines the estimated costs for each remedial alternative. For comparison, capital costs, operation and maintenance (O&M) costs, and the present value of capital and O&M costs are used to compare each alternative. In the Interim Remedy Feasibility Study, present values were calculated using a 5% discount rate and 20 years of operation. The assumption of a 20-year project life reflects EPA Superfund guidance; it does not reflect any specific finding regarding the duration of the interim remedy.

The cost of each alternative is shown in the table beneath Figure 5. On the basis of present value, Alternative 11C has the lowest cost (\$19,000,000), followed in order by 21, 64C, 64R and 11. The substantially higher costs for Alternative 11 (\$40,000,000) are primarily due to the capital and O&M costs of fluoride removal.

State Acceptance

State acceptance indicates whether, based on its review of the Remedial Investigation, Feasibility Study, and Proposed Plan, the state in which the site resides agrees with the preferred alternative. ADEQ is the lead agency for this site and has prepared this Record of Decision. Acceptance of this decision by the support agency, EPA, is indicated by EPA's concurrence and signature in Section I, Declarations.

Community Acceptance

Community acceptance is reflected in the community's support for, reservations about, or opposition to the various components of the alternatives. Fifteen individuals and organizations submitted comments on the Interim Remedy Feasibility Study, the IRFS Supplement, and the Proposed Plan for Operable Unit Two. These comments, and ADEQ's responses, are presented in the Responsiveness Summary (Appendix B of this Record of Decision). Comments from individuals, a citizens' group and organizations (including Potentially Responsible Parties, or PRPs) supported the idea of additional plume containment. Both the community and the PRPs (except one) felt that the proposed location for groundwater extraction was questionable due to incomplete hydrogeologic characterization and unclear effects of pumping on other sources of contamination. One PRP concurred with the selection of extraction near Interstate 10, but preferred Alternative 64C over 64R. The Gateway Neighborhood Coalition and other potentially responsible parties preferred groundwater extraction locations associated with Alternative 11, where they believe better hydrogeologic characterization exists, and where no other identified sources of contamination exist. One PRP recommended a combination of the proposed Alternative 64R and Alternative 11.

9. Selected Remedy

Based on consideration of the comparative analysis of alternatives and the requirements of the NCP, ADEQ and EPA have selected Alternative 64R as the interim remedial action for Operable Unit Two at the Motorola 52nd Street site. The remedial objectives of this interim action are to establish a capture zone across the entire width and depth of the contaminant plume, and to reduce concentrations of contaminated groundwater within the alluvial aquifer upgradient of the extraction wells. An additional objective of this remedy is to collect and analyze groundwater quality, groundwater flow, and other hydrogeologic data during implementation and operation of the remedy to support the selection of additional remedial actions for the site.

The elements of the selected remedy include:

- Installation of extraction wells near Interstate 10 and Van Buren Street. The extraction wells will pump water from the alluvial aquifer at an estimated rate of 4,000 gallons per minute. The actual location, number of wells and pumping rate, to be determined during remedial design, will be based on the objective of capturing the entire north-south width and depth of the contaminant plume exceeding MCLs for TCE.
- Contaminated groundwater withdrawn from the extraction wells will be treated to remove, as necessary, contaminants listed in Table 1. Treatment of contaminated groundwater will be conducted in a treatment facility located near the extraction wells using air stripping with off-gas treatment by synthetic resin adsorption. Recovered solvents will be transported to an approved facility for destruction. If design considerations indicate that the advanced oxidation treatment process would be effective and economical, ADEQ will consider approving the use of this technology in lieu of air stripping.
- Treated water will be piped to injection wells for injection back into the aquifer. The injection wells will be located in a manner to facilitate hydraulic containment of the contaminant plume and to provide the option of enhancing in-plume remediation.
- The remedy shall include the installation and sampling of groundwater monitoring wells, the sampling of existing monitoring wells, measurement of water levels at monitoring, extraction and injection wells, and the measurement of other aquifer properties in order to:
 - 1) evaluate the effectiveness of the remedy in meeting the remedial objectives.
 - 2) verify or revise contaminant influent concentration estimates that will be used in the design of the OU treatment facilities.
 - 3) provide an early warning network so that changes in the groundwater flow regime or contaminant concentrations that may require modifications in extraction rates, well locations or treatment methods are identified in time to institute the necessary facility and operational changes.

- 4) help determine the need for implementing additional remedial actions in Operable Unit Two and the nature of the final remedy.

Groundwater monitoring shall begin during the time of remedial design to provide data necessary to complete the final design and to establish pre-implementation conditions.

Containment of the plume at this location will be achieved within one year of system start-up. This interim remedy will continue to operate and will be combined with additional remedies leading to the final remedy for the site.

Locating the extraction wells near Interstate 10 captures a significantly larger area of the contaminant plume, and also contaminant mass, than would be achieved by locating them at the Grand Canal. Containment of this larger mass of contaminants is more protective of human health since it will reduce the future adverse impacts on downgradient water users and uncontaminated areas of the alluvial aquifer. Extraction in this location also captures contaminants from other known and unknown sources. The fact that inorganic contaminants are not addressed by Alternative 64R is not seen as a significant drawback, since removal of inorganic contaminants under Alternative 11 would be done solely because fluoride levels near the Grand Canal are high enough to require treatment in order to meet reinjection requirements (i.e., it would not produce any significant benefits to residents in this area of the site since the groundwater is not used as a source of domestic drinking water supply and fluorides in groundwater do not otherwise pose a health risk). The uncertainties concerning the nature of the bedrock high clearly make selection of a remedy at that location inadvisable, but those uncertainties do not have a significant impact on the effectiveness of Alternative 64R. The intermittent availability of the Grand Canal to accept treated water makes alternatives with this component undesirable.

Extraction near Interstate 10 creates a large capture zone that may include plumes from sources other than Motorola. Based on the available data, which ADEQ believes sufficient for the purposes of remedy selection, there is no reason to believe that the treatment system cannot be modified to effectively remove contaminants that would otherwise be incompatible with air stripping. The groundwater monitoring program which is a part of the remedy will provide the necessary information to design and implement such modifications if they are needed.

Implementation of Alternative 64R has the potential for significant traffic disruptions during construction of pipelines and installation of wells. ADEQ will work with affected residents and businesses during remedial design and construction to insure that adverse impacts are reduced to the extent practicable.

10. Statutory Determinations

Section 121 of CERCLA establishes several statutory requirements and preferences that address the selection of a remedial action. When complete, a remedial action must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a waiver is justified. The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a

preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances as their principal element. The following subsections discuss how the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Risk Assessment performed by ADHS identified potential exposure pathways at this site. These pathways include drinking contaminated water from a well tapping into the contaminated aquifer. By capturing and containing a major portion of the existing contaminant plume, the selected remedy reduces the potential for degradation of downgradient portions of the aquifer and thus reduces the risk of exposure of downgradient water users. The selected treatment technologies for extracted water will provide permanent destruction of VOCs removed during containment pumping, thereby avoiding any cross-media transfer of VOCs.

Implementation of this remedy will proceed quickly and will not pose any unacceptable short-term risks to the workers and surrounding community.

Compliance with ARARs

Pursuant to Section 121(d) of CERCLA, the on-site portion of a remedial action selected for a Superfund site must comply with all Applicable or Relevant and Appropriate Requirements (ARARs). Any portion of a remedial action which takes place off-site must comply with all laws legally applicable at the time the off-site activity occurs, both administrative and substantive. According to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300), "applicable" and "relevant and appropriate" are defined as follows:

- *Applicable requirements* means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.
- *Relevant and appropriate requirements* means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

Requirement are also classified as chemical-specific, location-specific, or action-specific.

- *Chemical-specific ARARs* are health- or risk-based concentration limits, numerical values, or methodologies for various environmental media (i.e., groundwater, surface

water, air, and soil) that are established for a specific chemical that may be present in a specific media at the site, or that may be discharged to the site during remedial activities. These ARARs set limits on concentrations of specific hazardous substances, pollutants, and contaminants in the environment. Examples of this type of ARAR are ambient water quality criteria and drinking water standards.

- *Location-specific* ARARs set restrictions on certain types of activities based on site characteristics. Federal and State location-specific ARARs are restrictions placed on the concentration of a contaminant or the activities to be conducted because they are in a specific location. Examples of special locations possibly requiring ARARs include flood plains, wetlands, historic places, and sensitive ecosystems or habitats..
- *Action-specific* ARARs are technology- or activity-based requirements which are triggered by the type of remedial activity. Examples are Resource Conservation and Recovery Act (RCRA) regulations for waste treatment, storage, and disposal.

Neither CERCLA nor the NCP provide across-the-board standards for determining whether a particular remedy will result in an adequate cleanup at a particular site. Rather, the process recognizes that each site will have unique characteristics that must be evaluated and compared to those requirements that apply under the given circumstances. Therefore, ARARs are identified on a site-specific basis from information about specific chemicals at the site, specific features of the site location, and actions that are being considered as remedies.

Table 5 provides an outline of the location- and action-specific ARARs that apply to this site and to this interim remedy. Because the selected remedy is an interim remedy, it may not achieve final cleanup levels for the groundwater and no chemical-specific ARARs for aquifer cleanup are included.

The selected remedy will comply with all applicable or relevant and appropriate requirements. Since the selected remedial action for Operable Unit Two is an interim action, cleanup requirements for the aquifer such as attaining MCLs, which would be ARARs for a final remedy, are not ARARs for this remedy. ARARs for the selected remedy are identified in Table 5.

Cost Effectiveness

ADEQ believes that the selected remedy is cost-effective in providing control of the contaminated groundwater in a reasonable period of time. Section 300.430 of the NCP requires cost-effectiveness be evaluated by comparing all the alternatives which meet the following criteria: protection of human health and the environment; long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness. While long-term effectiveness will be addressed by the final remedy, the selected interim remedy meets these remaining criteria and provides for overall effectiveness in proportion to its cost. The estimated present worth for the selected remedy is \$31,000,000.

Table 5. Location- and Action-Specific Applicable, or Relevant and Appropriate Requirements (ARARs) of federal and state laws.

| Citation | Requirement |
|---|---|
| Location-specific ARARs | |
| Endangered Species 16 U.S.C. §1531 et seq. | If endangered species are found within or adjacent to the site, remedial actions shall comply with the requirements for endangered species in accordance with the Endangered Species Act. |
| Fish and Wildlife 16 U.S.C. §661 et seq., 40 CFR §6.302 | Remedial actions shall protect the fish and wildlife of the area in accordance with 16 USC §661 et seq. |
| National Archeological and Historical Preservation Act, 16 U.S.C. §469, 36 CFR Part 65, A.R.S §41-841 -847 and A.R.S. §41-865 | The laws governing archaeological discovery and preservation shall be followed if artifacts or human remains are discovered. |
| Action-specific ARARs | |
| New Well Construction & Groundwater Use Requirements Arizona Revised Statutes, Title 45; 45 A.R.S. §454.01; and §45-594, -595 and -596 | Section 45-454.01 of the Arizona Groundwater Management Act (GMA) is relevant and appropriate to the site. For activities conducted onsite, the substantive portions of the provisions within the GMA are applicable. Remedial actions undertaken pursuant to CERCLA must meet the following requirements: a new well is subject to sections 45-594 (Well construction standards); 45-595 (Well construction requirements; licensing of well drillers and pump installation contractors); withdrawn groundwater must be reinjected into the aquifer or be put to reasonable and beneficial use, and a person who uses groundwater withdrawn in an active management area may be subject to the withdrawal fee and shall use the groundwater only pursuant to Articles 5-12 of Title 45, Chapter 2; and 3. |

Table 5. (continued) Location- and Action-Specific Applicable, or Relevant and Appropriate Requirements (ARARs) of federal and state laws.

| Citation | Requirement |
|---|--|
| <p>Arizona Air Pollution Control Regulations A.R.S. 49-401 et seq. Maricopa County Air Pollution Control Regulations Rules 200, 210,220 and 320</p> | <p>As a part of the delegated program, the Maricopa County Air Pollution Control Regulations adopted by the Board of Supervisors, October 1, 1990, Maricopa County Air Quality Standards (Rules 200, 210,220 and 320) are a part of the State Implementation Plan as dictated by the Clean Air Act and/or 40 CFR 264, Subparts AA and BB. The substantive portions of the regulations are applicable for remediation of groundwater at the site.</p> |
| <p>Discharge to Aquifer A.R.S. §49-241 through 49-244.</p> | <p>Portions of the Arizona statutory code for discharge to an Aquifer, (defined in A.R.S. 49-201, 203 and 49-241, et seq) and implementing regulations (A. A. C. R18-9-101, et seq.) are applicable to the Motorola 52nd Street Site. If Motorola discharges it shall comply with the substantive requirements for an Aquifer Protection Permit.</p> |
| <p>Air stripper Emissions Resource Conservation and Recovery Act (RCRA) (40 C.F.R. Part 265, Subpart AA and BB)</p> | <p>The RCRA requirements apply to air emission standards for process vents and equipment leaks associated with distillation, solvent extraction or air stripping operations. The requirements impact those operations that manage hazardous waste with organic concentrations of at least 10 parts per million. These requirements are applicable.</p> |
| <p>"Contained in" principle Arizona Hazardous Waste Management Act (AAC R18-8-261)</p> | <p>The "contained in" principle provides that any non-waste material (e.g., groundwater) that contains a listed hazardous waste must be managed as if it were a hazardous waste. Groundwater extracted as part of this interim remedy will contain a listed hazardous waste, therefore these regulations are applicable to the management of that groundwater.</p> |

Table 5. (continued) Location- and Action-Specific Applicable, or Relevant and Appropriate Requirements (ARARs) of federal and state laws.

| Citation | Requirement |
|--|--|
| Arizona Hazardous Waste Management Act, AAC R18-8-262 | The regeneration or disposal of spent carbon or other media after use to control emissions of VOCs must be managed in conformance with the generator requirements of the state Hazardous Waste Management Act, including disposal at a permitted hazardous waste facility. |
| Arizona Hazardous Waste Management Act Land Disposal Restrictions, AAC R18-8-268 | Groundwater treatment residuals or other media contaminated with volatile organic compounds are banned from land disposal. Treatment standards must be met before wastes can be land disposed. |
| Arizona Hazardous Waste Management Act, AAC R18-8-264 (40 CFR Subpart X) | Air stripping towers are miscellaneous RCRA units, therefore, the substantive requirements of 40 CFR Subpart X, including any closure and post-closure care, will be applicable or relevant and appropriate. |
| Other Action-specific requirements | |
| Air stripper Emissions EPA OSWER Directive 9355.0-2.8, June 1989 | The OSWER directive shall be met for control of air emissions from air strippers used at a Superfund site for groundwater treatment. Controls will be required as part of this interim remedy on sources with an actual emission rate of 3 lb/hr or 15 lb/day or a potential rate of 10 tons per year of total VOCs because VOCs are ozone precursors. |

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The State of Arizona and EPA have determined that the selected interim remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the limited scope of this action. The primary factor in selecting Alternative 64R for this interim remedy was the reduction of toxicity, mobility, or volume of contaminants through treatment. Alternative 64R captures the largest area of contamination. The selected remedy also permanently removes and destroys the VOC contamination in the groundwater, thereby utilizing permanent solutions and treatment technologies to the maximum extent practicable.

Preference for Treatment as a Principal Element

VOC contaminated groundwater will be extracted, and the VOCs removed by either air stripping or advanced oxidation. VOC vapors from air stripping will be captured and concentrated through synthetic resin adsorption for off-site incineration. Therefore, this remedy satisfies the statutory preference for remedies that employ treatment of the principal threat which permanently and significantly reduces toxicity, mobility, or volume of hazardous substances as a principal element.

11. Documentation of Significant Changes

The Proposed Plan for Operable Unit Two was released for public comment in January 1994. The Proposed Plan identified Alternative 64R (extraction near Interstate 10, treatment to remove VOCs and disposal through injection wells) as the preferred alternative. ADEQ reviewed all written and oral comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

Comments on the Proposed Plan suggested that Alternative 64C (with discharge to the Grand Canal) was preferable to 64R because the costs and traffic disruptions were lower and because there would be a more immediate beneficial use of the treated water. However, the Salt River Project, which maintains and operates the canal, noted in their comments that treated water could not be discharged during the annual month-long maintenance of the canal and that there may be times when irrigation demands were too low to allow the discharge of 4,000 gpm. Because of these uncertainties about the continuity of discharge to the canal and the resulting undetermined impacts on maintaining the capture zone if extraction flows had to be reduced or temporarily stopped, ADEQ did not select 64C. Nonetheless, ADEQ is willing to consider and evaluate, during remedial design, a treated water disposal option that incorporates both reinjection and canal discharge if it is economical and does not reduce the effectiveness of the remedy.

APPENDIX A.

Administrative Record Index

ADMINISTRATIVE RECORD INDEX

MOTOROLA 52ND STREET SITE

| Document Number | Date | ADEQ File # (4070.-) | Description |
|-----------------|----------|-------------------------|--|
| 1 | 07/06/83 | 1.11.1.05 | Map: Irrigation System, Chlorinated Hydrocarbon Analyses (Hubbard) |
| 2 | 08/19/83 | 1.1.10.3 | Chemical Leak Briefing (ADHS, ADWR) |
| 3 | 10/04/83 | 1.1.11.1.03 | GC/MS Volatile Organics Analysis |
| 4 | 11/23/83 | 1.1.11.1.01 | Samp./Analysis Data (B. Wiley) |
| 5 | 12/09/83 | 1.1.10.4 | Rpt: Preliminary Report Chemical Leak Project (Motorola, Inc.) |
| 6 | 12/15/83 | 1.1.10.5 | Report: Evaluation of Analysis Data (G. Muth) |
| 7 | 01/04/84 | 1.1.3.2.39 | Comments on Chemical Leak Report of December 9, 1983 (N. Ferrari) |
| 8 | 01/09/84 | 1.1.3.2.36 | Comments on Preliminary; Report, Chemical Leak Project (H. Seraydarian) |
| 9 | 01/13/84 | 1.1.3.2.31 | Cover Ltr, for Preliminary Report and Chemical Data/Chemical Data as Requested for Submittal to State (P. McClellan, P.E.) |
| 10 | 01/20/84 | 1.3.08 | Preliminary Assessment Region IX with Related Memos Attached (J. Shepherdson) |
| 11 | 01/24/84 | 1.1.4.2.12 | Transmittal: Request for Phase II Investigation Proposal and Review Comments (C. Anders) |
| 12 | 01/24/84 | 1.1.5.3.22 | Memorandum re: Consolidated ADHS Review Comments, Motorola 12/09/83 Presentation (W. Wiley) |
| 13 | 02/17/84 | 8.3.1.07 | Comments on Site Materials Submitted (Superfund Implem. Gp.) |
| 14 | 02/17/84 | 1.1.3.2.25 | EPA Comments on Section 7.2 of Preliminary Report w/Copy (H. Seraydarian) |
| 15 | 02/27/84 | 1.1.10.7 | Sampling Plan, Motorola, Inc. (J. Rubin) |
| 16 | 02/21/84 | 8.3.1.06 | Review Comments on Dr. Teitelbaum's Toxicology Report on the Groundwater Contamination (E. Theriault, M.D.) |
| 17 | 02/22/84 | | Comments on Motorola Sampling Plan (K. Wong) |
| 18 | 02/23/84 | 1.3.06 | Ltr. re: ADHS Letter to Geno Ori, Motorola, Inc., 2/1/84 (S. Stephens) |
| 19 | 03/09/84 | 3.5.2.13 | Memo: Task Force Meeting, March 1, 1984, Summary (B. Wiley) |
| 20 | 03/09/84 | | Well Sample Analysis Data - TCA (B. Wiley) |

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| Document Number | Date | ADEQ File # (4070.-) | Description |
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| 21 | 03/06/84 | 1.3.05 | Ltr: Response to Comments on Preliminary Assessment (N. Weiss) |
| 22 | 03/13/84 | | Ltr. re: Request for Information, an Extension to May 15, 1984 is Requested (R. Pettycrew) |
| 23 | 03/21/84 | 3.9.1.1.15 | Ltr: Response to Comments on Preliminary Report - Chemical Leak Project (H. Seraydarian) |
| 24 | 03/26/84 | 1.1.3.2.14 | Ltr: Poor Quality Water Withdrawal Permit Requirements (P. Briggs) |
| 25 | 03/29/84 | 3.5.2.12 | Summary of Task Force meeting |
| 26 | 04/04/84 | 1.4.01 | Site Inspection Report - Motorola 52nd St. Facility (original) w/Copy (U.S. EPA) |
| 27 | 04/05/84 | 1.3.03 | Ltr: Comments on Preliminary Assessment (K. O'Regan) |
| 28 | 04/09/84 | 1.1.11.2.08 | Ltr: Chemical Data from Monitoring Wells(G. Gutierrez) |
| 29 | 04/10/84 | | Memo: Laboratory Data Discrepancy (J. Rubin) |
| 30 | 04/20/84 | 1.1.1.9 | Plan: Sampling Plan REM/FIT Zone II (EPA-9) |
| 31 | 04/24/84 | 3.6.4.33 | Ltr: Comments on Phase II Work Plan Outline for RI/FS (T. Turner) |
| 32 | 04/27/84 | 3.8.2.07 | Monthly Progress Report, Apr. 1984 (G. Gutierrez) |
| 33 | ?? | 1.1.5.3.01 | Exhibit C: hazardous Substance list and Contract Required Detection Limits |
| 34 | 05/03/84 | | Response to EPA's Draft Letter (R. Pettycrew, P. Briggs) |
| 35 | 05/16/84 | 3.9.1.1.10 | Proposed Outline for Revised RI/FS work Plan (5/17/84), Attached to 5/16 Cover Letter. (R. Lee) |
| 36 | 05/22/84 | 3.5.2.10 | Summary of Working Group Meeting of 5/17/84 (B. Wiley) |
| 37 | 05/29/84 | 1.11.2.04 | Analytical Results of Water Samples for EPA Method 502.1 & 503.1 (Analytical Techn.) |
| 38 | 06/06/84 | 3.6.1.27 | ADHS, EPA, and ADWR Review Comments on 5/17 workplan Submittals (C. Anders) |
| 39 | 06/15/84 | 3.8.2.06 | Monthly Progress Report, May 1984 (R. Lee) |

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| Document Number | Date | ADEQ File # (4070.-) | Description |
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| 40 | 07/02/84 | 3.6.4.30 | Memo: RI/FS Workplan Comments |
| 41 | 07/09/84 | 3.8.2.05 | Monthly progress report, June 1984 (R. Lee) |
| 42 | 07/17/84 | 3.6.1.25 | Ltrs: Comments on Phase I and II workplan Draft (C. Anders) |
| 43 | 07/18/84 | | RI/FS Workplan Summary of Responses to Comments |
| 44 | 07/18/84 | | Memo: Comments on Draft Phase II Workplan (File) |
| 45 | 07/24/84 | | Ltr: Transmittal of Chemical Quality/Water Level Data Points (M. Hay) |
| 46 | 08/03/84 | 3.5.2.06 | Ltr: Summary of 18 July 1984 technical Committee Meeting (B. Wiley) |
| 47 | 08/07/84 | 3.8.2.04 | Activities Report, July 1984 (R. Lee) |
| 48 | 09/05/84 | 3.5.2.05 | Summary of Technical Committee Meeting, 8/24/84 (B. Wiley) |
| 49 | 09/13/84 | 1.11.2.01 | Chemical Quality/Water Level Elevation Data Plots (Gutierrez-Palmenberg) |
| 50 | 09/14/84 | 3.6.3.31 | Comments on Draft RI/FS. Workplan and Quality Assurance Project Plan (H. Seraydarian) |
| 51 | 09/25/84 | 3.5.2.04 | Summary of Technical Committee Meeting, 9/19/84 (B. Wiley) |
| 52 | 09/27/84 | 3.6.1.23 | ADHS Comments on Draft RI/FS Work Plan (C. Anders) |
| 53 | 10/01/84 | 1.1.10.10 | Sample Documentation Report, Motorola, Inc. (R. Goloubow, J. Rubin, J. Surfus) |
| 54 | 10/17/84 | 3.6.4.27 | Review comments on Quality Assurance Program Plan (T. Turner) |
| 55 | 10/22/84 | 3.5.2.03 | Summary of 10/10/84 Technical Committee Meeting (B. Wiley) |
| 56 | 11/14/84 | 3.8.2.01 | Monthly Progress Report; Oct. 1984 (R. Lee) |
| 57 | 11/27/84 | 3.5.2.01 | Summary of Items Discussed at Technical Committee meeting of 11/14/84 |
| 58 | 11/30/84 | 3.1.3 | Task Specifications - Stratigraphic Boring/Well - RI/FS Motorola (Dames & Moore) |
| 59 | 12/07/84 | 3.1.4 | Task Specification; Soil-Gas Sampling RI/FS - Motorola, Inc. (Dames & Moore) |

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MOTOROLA 52ND STREET SITE

| Document Number | Date | ADEQ File # (4070.-) | Description |
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| 60 | 12/11/84 | | ?? (M. Rozelle) |
| 61 | 12/21/84 | 10.2.3.02 | Memo: Discussion w/Robert Lee on 12/18/84 and 12/19/84 re: CRP |
| 62 | 01/01/85 | 10.6.1.17 | Newsletter #1 "Update 52nd St. RI/FS" (Motorola, Inc.) |
| 63 | 01/17/85 | 4.3.2 | Groundwater Treatment Plant Bid Package (Attached to 1/17/85 Cover Letter) (P. Casey, G. Lamb) |
| 64 | 01/22/85 | 3.8.3.11 | Monthly Progress Report, Nov. 1984 (R. Lee) |
| 65 | 01/23/85 | 3.8.3.10 | Monthly Progress Report; Dec. 1984 (R. Lee) |
| 66 | 01/23/85 | | Draft Data management Task specification |
| 67 | 01/23/85 | 4.2.2 | Bench Scale Treatability Study (Dames & Moore) |
| 68 | 02/13/85 | 4.3.1.1 | Addendum No. 1 to Specification for Fabrication of Pilot Treatment System for Contaminated Groundwater (P. Casey, L. Foster) |
| 69 | 02/11/85 | 3.9.1.2.07 | Proposed Soil-Gas Sampling Locations (R. Lee) |
| 70 | 02/18/85 | 3.1.7 | Draft Sampling and Analysis Task Specification (R. Lee) |
| 71 | 02/27/85 | 3.6.1.19 | Comments on Draft Specifications for Pilot Treatment Plant (W. Wiley) |
| 72 | 02/27/85 | | Work Plan Amendments (L. Foster) |
| 73 | 02/27/85 | 3.8.3.08 | Monthly Report, Jan. 1985 (R. Lee) |
| 74 | 03/11/85 | 3.5.3.24 | Summary of 2/27/85 Technical Committee Meeting (B. Wiley) |
| 75 | 03/12/85 | 3.6.3.25 | EPA Comments on Draft Task Specification for Sampling & Analysis (A. Strauss) |
| 76 | 03/13/85 | | Comments on Draft Sampling and Analysis Task Specifications (B. Hammett) |
| 77 | 03/19/85 | 3.6.1.18 | Comments on Draft Task specifications for Water Sampling and Analysis (B. Wiley) |
| 78 | 03/21/85 | 3.5.3.22 | Summary of 3/18/85 Meeting (B. Wiley) |
| 79 | 03/25/85 | 3.4.55 | 2 Final Phase I Reports - RI/FS Study Motorola Inc. (Gutierrez-Palmenberg) |

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| 80 | 04/03/85 | 3.8.3.7 | February Activity Reports of Progress (R. Lee) |
| 81 | 04/03/85 | 3.7.16 | Draft Responses GW/SW Sampling and Analysis TS |
| 82 | 04/03/85 | 3.7.18 | (inside package) Responses - Bench Scale Treatability Study |
| 83 | 04/03/85 | 3.7.17 | Responses - Pilot Plant Specifications |
| 84 | 04/25/85 | 3.1.8 | Task Specification for Modeling of Groundwater Contamination RI/FS Motorola Inc. (Dames & Moore) |
| 85 | 05/03/85 | 3.5.3.18 | Summary of 4/3/85 Technical Subcommittee meeting (B. Hammert) |
| 86 | 05/13/85 | 3.8.3.05 | April Activity Reports of Progress (G. Gutierrez) |
| 87 | 05/24/85 | 3.1.10 | Final Groundwater Level Monitoring Task Specification (R. Lee) |
| 88 | 06/10/85 | | Transmittal of Volatile Priority Pollutant Analysis (B. Wiley) |
| 89 | 06/21/85 | 3.5.3.15 | Agenda: 6/26/85 Technical Subcommittee Mtg. and Summary 5/13/85 Technical Subcommittee Mtg. (B. Hammert) |
| 90 | 06/26/85 | 3.8.3.04 | May Activity Reports of Progress (R. Lee) |
| 91 | 07/24/85 | 3.4.2 | Draft Report Stratigraphic Borings Monitoring Wells - RI/FS Motorola 52 Discrete Semiconductor Facility (Dames & Moore) |
| 92 | 08/08/85 | 3.4.3 | Draft Report (revision) Soil-Gas Investigation - RI/FS Motorola Inc. (Dames & Moore) |
| 93 | 08/28/85 | 3.5...11 | Memo: Technical Subcommittee Meeting Notes (B. Hammert) |
| 94 | 09/04/85 | | Ltr: Activity Reports; June & July (R. Lee) |
| 95 | 09/16/85 | 3.7.10 | Ltr: Responses to Comments on Draft Source Verification Task Specification Report (R. Lee) |
| 96 | 09/16/85 | 3.7.10 | Responses to Source Verification Task Specification Comments (8/12/85 - EPA & 8/23/85 - ADHS) & Final Source Verification Task Specification (R. Lee) |
| 97 | 09/20/85 | 3.2.13 | Ltr: Westbay. Sampling Results, April/May 1985 (J. Hussey, E. Ricci) |
| 98 | 09/23/85 | 3.9.1.2.01 | Ltr: Pilot Treatment Plant and Well Installation (J. Hussey) |

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| 99 | 09/26/85 | | CSMS Waste Oil Storage Tank Monitoring Well (T. Galkowski) |
| 100 | 09/28/85 | 3.5.3.11 | Memo: Technical Subcommittee Meeting Sept. 1985 RI/FS Press Reports Aug. 1985 Attached (A. Hammett) |
| 101 | 10/17/85 | 3.5.3.09 | Memo: Technical Committee Meeting Advisory (B. Hammett) |
| 102 | 10/18/85 | 3.6.3.21 | Ltr: Comments on Draft Soil Gas Investigation and Stratigraphic Borings/Monitoring Wells Reports (A. Strauss) |
| 103 | 10/21/85 | 3.5.3.08 | Minutes of Meeting/TSC Source Verification Planning |
| 104 | 10/21/85 | 3.5.3.10 | Memo: Technical Sub-Committee Meeting Advisory (B. Hammett) |
| 105 | 10/22/85 | 3.5.3.07 | Fact Sheet on Water Analysis (Dames & Moore) |
| 106 | 10/22/85 | 3.8.3.01 | Ltr: RI/FS Progress Report, October 1985 (R. Lee) |
| 107 | 11/06/85 | 3.4.4 | Draft Well Evaluation Report - RI/FS Motorola 52 (Dames & Moore) |
| 108 | 11/26/85 | 3.2.1.3A | Results of Private Well Sampling (J. Hussey, E. Ricci) |
| 109 | 11/27/85 | 3.4.5 | Draft Aquifer-testing: A Preliminary Report - Motorola 52 (Dames & Moore) |
| 110 | 12/18/85 | 3.5.3.02 | Memo: Technical & Modeling Sub-Committee Meeting Notes (J. Rampe) |
| 111 | 12/21/85 | 3.3.1.02 | Community Relations Plan-Final RI/FS, Motorola Site (R. Lee) |
| 112 | 01/20/86 | 3.4.6 | Revised Phase I Report RI/FS - Motorola 52 (Gutierrez-Palmenberg) |
| 113 | 01/21/86 | 3.8.4.05 | Ltr: Activity Reports of Progress for Nov/Dec with Reports Attached (2 Copies) (R. Lee) |
| 114 | 01/22/86 | | Bench Scale Groundwater Treatability Study (Dames & Moore) |
| 115 | 03/28/86 | 3.1.13 | Cover Ltr. with "TS for. Additional Borings and Wells: Second Phase" (J. Hussey, S. Smith) |
| 116 | 03/31/86 | 3.5.4.07 | Memo: Highlights of March 21, 1986 Mtg. (J. Rampe) |
| 117 | 04/01/86 | 3.4.9 | Groundwater Modeling Study for Motorola 52: Summary of Stage I (Preliminary) Model Investigations (Dames & Moore) |

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| 118 | 04/03/86 | | Subsurface Remedial Investigation Plan No. 38-26-0928-86, ANG, Papago Military Reservation, Phoenix, Arizona, March 3, April 3, 1986 (U.S. Army EHS) |
| 119 | 04/09/86 | 3.1.14 | Cover Ltr. with TS for Courtyard and Wells and Borings (J. Hussey) |
| 120 | 05/28/86 | 3.4.10 | Draft Aquifer Testing: Second Report RI/FS - Motorola 52 (Dames & Moore) |
| 121 | 06/02/86 | 3.1.15 | (dated 07/02/86) Cover Ltr. with TS for Additional Wells: Third Phase |
| 122 | 06/18/86 | 4.3.4 | Cover Ltr. with PTP Design and Schedule Drawings (J. Hussey) |
| 123 | 06/24/86 | 3.4.11 | Interim Summary Report (Draft) RI/FS Motorola 52 (Dames & Moore) |
| 124 | 06/27/86 | 3.8.4.02 | Cover Ltr: with June Activity Reports (R. Lee) |
| 125 | 07/16/86 | 3.4.11 | (inside package) Ltr. Revisions to Figures 6.5, 6.6, & 6.16, "Interim (Summary Report (Draft))" RI/FS 52nd St. Facility for Motorola, Inc. w/copy |
| 126 | 07/21/86 | 3.5.4.05 | Memo: Highlights of 6/27/86 Meeting (R. Henckel) |
| 127 | 07/23/86 | 3.6.3.16 | Ltr: Interim Summary Report Comments (A. Strauss) |
| 128 | 07/25/86 | 3.7.06 | Ltr. with Responses to ADWR 6/20/86 Comments on Stage I (Preliminary) Model Investigations Rpt. (J. Hussey) |
| 129 | 07/28/86 | 3.6.4.20 | Ltr. Review Comments on Draft Interim Summary Report of 6/24/86 (R. Henckel) |
| 130 | 07/30/86 | 3.2.02 | Ltr: Proposed Revising, 1986 Ground Water Sampling Plan, New and Existing wells (J. Hussey, E. Ricci) |
| 131 | 07/31/86 | 3.6.1.06 | Ltr: Review Comments on Interim Summary Report and TS for Additional Wells: Third Phase (S. Navarro) |
| 132 | 07/31/86 | 3.8.4.01 | Ltr: June Activity Reports of Progress (R. Lee) |
| 133 | 08/01/86 | 4.2.3 | 2 Copies Draft Screening Report - Feasibility Study - Motorola 52 RI/FS (Dames & Moore) |
| 134 | 08/13/86 | 3.4.12 | 2 Copies Draft Source Verification Report - RI/FS Motorola 52 (Dames & Moore) |

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| 135 | 08/19/86 | | Ltr: Results of Second Quarter Off-Site Sampling with VOA Analyses of Water Samples Attached (T. Potucek) |
| 136 | 08/22/86 | 3.6.1.05 | Ltr: Review Comments on Interim Summary Report of 6/17/86 (T. Potucek) |
| 137 | 09/04/86 | 3.6.1.04 | Ltr: Review Comments Draft Source Verification Report RI/FS (T. Potucek) |
| 138 | 09/08/86 | 3.5.4.03 | Memo: Highlights of 8/1/86 Mtg. List of Attendees and Proposed Agenda (R. Henckel) |
| 139 | 09/10/86 | 3.7.05 | Response to Comments Interim Summary Rpt. RI/FS (J. Hussey) |
| 140 | 09/10/86 | 3.4.11 | (inside package) Submittal of Chapter 4 Interim Summary Rpt (Draft) RI/FS (J. Hussey) |
| 141 | 09/11/86 | 3.9.1.3.02 | Ltr. re: Leaking Underground Storage Tank investigation at Papago Military Reservation (T. Potucek) |
| 142 | 09/16/86 | | Ltr: Addendum to: TS for Additional Wells: Third Phase (J. Hussey) |
| 143 | 09/17/86 | | Ltr: FS Screening Report Comments (A. Strauss) |
| 144 | 09/22/86 | 3.6.3.15 | Ltr: Review Comments on Draft Source Verification Report (A. Strauss) |
| 145 | 09/25/86 | 3.4.13A | Revisions Interim Summary Report (Draft) (G. Miller) |
| 146 | 10/01/86 | 4.5.1.07 | Ltr: Review Comments on Screening Report Dated August 1986 (T. Potucek) |
| 147 | 10/29/86 | 3.5.4.01 | Highlights of September 24, 1986 Mtg. (R. Henckel) |
| 148 | 11/12/86 | 3.6.3.18 | (inside package) Comments on the Draft Physical Chemistry Investigation (A. Strauss) |
| 149 | 12/10/86 | 1.1.4.3.02 | Routing and Transmittal Slip; Ltr. re: Direction of the LUST and Motorola Related Contamination Investigation (T. Potucek) |
| 150 | 12/23/86 | 3.7.04 | RI/FS Work Plan: Responses to Review Comments - Draft SV Report (G. Miller) |
| 151 | 12/23/86 | 3.7.03 | RI/FS Work Plan: Responses to Review Comments - Physical Chemistry Investigation (Draft) |
| 152 | 03/20/87 | | Preliminary Report; Groundwater Contamination Survey No. 38-26-0858-87 |

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| | | | AZ ANG Papago Military Reservation, Phoenix, AZ (K. Daubel) |
| 153 | 04/16/87 | 3.5.5.05 | (inside package) Memo: Highlights of February 12; 1987 Meeting (R. Henckel) |
| 154 | 05/12/87 | 3.1.16 | Task Specification Long Term Ground-Water Sampling Program for the Motorola Inc. 52nd St. RI/FS (R. Lee) |
| 155 | 06/01/87 | 3.4.15 | Attachment B to the Remedial Investigation Report for Motorola Inc. June 1987 (Dames & Moore) |
| 156 | 06/01/87 | | Attachment A Remedial Investigation Report (Draft) June 1987 (Dames & Moore) |
| 157 | 06/01/87 | 3.4.14 | Report Test Remedial Investigation Volume I of IV (Dames & Moore) |
| 158 | 06/01/87 | 3.4.14 | Appendices Remedial Investigation Volume III of IV (Dames & Moore) |
| 159 | 06/01/87 | 3.4.14 | Appendices Remedial Investigation (Draft) Volume IV of IV (Dames & Moore) |
| 160 | 06/01/87 | 4.2.4 | Report Feasibility Study (Draft) (Dames & Moore) |
| 161 | 06/30/87 | | Report Test Remedial Investigation (Draft) Volume I of IV w/Ltr. re: RI Report/Superfund Project (Dames & Moore) |
| 162 | 07/14/87 | 3.2.1.11 | Results of the June; 1987 Ground Water Sampling, 52nd St. RI/FS (D. Hanson) |
| 163 | 07/23/87 | 3.5.5.02 | (inside package) Memo: re: Highlights of the July 14, 1987 Meeting with Agenda and List of Attendees (R. Henckel) |
| 164 | 07/29/87 | | Motorola 52nd St. Public Health Assessment Cover Letter (K. Takata) |
| 165 | 08/05/87 | | Motorola 52nd St. Draft RI/FS Cover Letter (K. Takata) |
| 166 | 08/20/87 | 3.6.3.14 | EPA's Comments on the Draft FS Report (A. Strauss) |
| 167 | 08/24/87 | 4.6.09 | Ltr. re: Review Comments, Motorola 52nd St. FS (Draft) Report (June 1987) (S. Navarro) |
| 168 | 09/01/87 | 4.6.08 | Risk Characterization Review of the Motorola 52nd St. Feasibility Study (S. |

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| | | | Englander, N. Petersen) |
| 169 | 09/18/87 | 4.5.1.05 | Comments on Motorola 52nd St. F/S Report (J. Anders) |
| 170 | 10/06/87 | 3.6.3.13 | Completed Comments on Review of the Remedial Investigation Report Plus Major Recommendations (J. Anderson) |
| 171 | 10/06/87 | 3.5.5.01 | Highlights of the September 9, 1987 TSC meeting (R. Henckel) |
| 172 | 10/15/87 | 3.6.4.37 | (inside package) ADWR Comments on the Motorola 52nd St. Draft Remedial Investigation Report (R. Henckel) |
| 173 | (none) | | Computation of Population Served |
| 174 | (none) | | Draft Communication Strategies for Site Proposed to Drop from the NPL (H. Hadlock, A. Kaswan) |
| 175 | 05/02/88 | 8.1.1.02 | Health Assessment for Motorola 52nd Street Facility (ATSDR) |
| 176 | 06/24/88 | 5.4.1 | Draft Remedial Action Plan, Motorola 52nd Street (Dames & Moore) |
| 177 | 06/26/88 | 10.1.09 | Ltr: Comments on Newsletter #6 (Robert C. Anderson, P.E.) |
| 178 | 07/03/88 | 3.9.1.5.03 | Ltr: Additional Comments on. Newsletters #1 through #5 (Robert C. Anderson, P.E.) |
| 179 | 07/11/88 | 10.4.1.1 | Transcript: Motorola 52nd Street Site Remedial Action Plan, Public Hearing (Paul H. Landsman, RPR Court Reporter) |
| 180 | 07/18/88 | 10.1.06 | Ltr: List of Concerns Regarding Motorola 52nd Street Site (Pamela E. swift, Chairwoman, Toxic Waste Investigative Group, Inc.) |
| 181 | 07/25/88 | 5.4.1.2A | Ltr: re: Proposed Remedial Action Plan (RAP) of Motorola, Inc. (Matthew R. Berens for Heron, Burchette, Ruckert and Rothwell) Letter Report East High School Property by Water Resources Associates, Inc., enclosed. |
| 182 | 07/27/88 | 10.8 | Ltr: re: Motorola 52nd Street Site Remedial Action Plan-A late Comment (James J. Lemmon, R.G. at the Urban Research Association.) |
| 183 | 09/12/88 | 8.2.04 | Report: Work Product A-Task Assignment Number 13, Contract Number 2207-000000-3-3-DR-7084 (Health Risk Assessment by ADHS) |

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| 184 | 01/11/88 | 4.7.03 | Responses to RI/FS comments (W. Keilen) |
| 185 | 09/27/88 | 5.4.1.1 | Letter of Determination - OU1 (N. Weiss) |
| 186 | 09/27/88 | 5.4.1.1A | Responsiveness Summary |
| 187 | 09/30/88 | 5.1 | Record of Decision - OU1 (D. McGovern) |
| 188 | 01/27/89 | 3.9.1.6.05 | Ltr: Proposal for expanding modeling in Phoenix Active Management Area (D. Toy) |
| 189 | 04/14/89 | 6.3.04 | Potential Impact of Motorola Site on East Washington WQARF area (S. Eberhardt) |
| 190 | 06/20/89 | 7.4.6 | Consent Order |
| 191 | 07/24/89 | 7.4.6.1 | Consent Order signature by Superior Court |
| 192 | 08/10/89 | 3.9.1.6.03 | Ltr: Statement of Work for Consent Order (R. Lee) |
| 193 | 08/11/89 | 7.5.1.01 | Statement of Work required by Consent Order (R. Lee) |
| 194 | 08/25/89 | 7.9.2.02 | Ltr: Comment on Statement of Work (D. Atkinson) |
| 195 | 08/27/89 | 7.5.2.04 | Addendum No. 1 to Statement of Work (R. Lee) |
| 196 | 01/06/90 | 3.9.1.7.08 | Progress on RI/FS (J. Zelikson) |
| 197 | 01/09/90 | 3.2.1.12 | Transmittal-Water Quality Data through 6/89 (Dames & Moore) |
| 198 | 01/22/90 | 3.2.1.13 | Transmittal-geophysical logs, selected aquifer test data (Dames & Moore) |
| 199 | 01/24/90 | 3.5.8.08 | Meeting minutes |
| 200 | 03/14/90 | 3.4.16 | Review of Bedrock Issues (Dames & Moore) |
| 201 | 03/20/90 | 3.6.2.25 | Memo: 90% Design Package - comments (B. Thatcher, Jr.) |
| 202 | 03/22/90 | 3.6.2.24 | Memo: Review of Bedrock Issues - comments (B. Thatcher, Jr.) |
| 203 | 04/16/90 | 3.1.19 | Draft Task Specification Review of Potential Inorganic Contamination (Dames & Moore) |
| 204 | 04/19/90 | 3.6.2.20 | Ltr: Comments on Task Spec Plume Definition (D. Atkinson) |

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| 205 | 05/02/90 | 3.6.2.18 | Ltr: EPA comments on Review of Bedrock Issues & Task Spec Plume Definition (H. Lauer) |
| 206 | 05/14/90 | 3.6.2.16 | Ltr: Comment on Draft Soil Vapor Extraction Basis (D. Atkinson) |
| 207 | 05/14/90 | 3.6.2.17 | Ltr: review of draft Task Spec for Review of Potential Inorganic Contaminants (D. Atkinson) |
| 208 | 07/03/90 | 3.3.3 | Final Remedy Workplan Outline & Revised Plume Definition Program (Dames & Moore) |
| 209 | 07/25/90 | 3.6.4.11 | Ltr: Comment on Well Abandonment Workplan, Revised Plume Definition Program (B. Davis) |
| 210 | 08/02/90 | 3.6.2.12 | Ltr: ADEQ, ADWR, EPA review of Workplan Outline & Revised Plume Definition Program (D. Atkinson) |
| 211 | 08/10/90 | 8.2 | Cancer Incidence & Mortality in East Phoenix (ADHS) |
| 212 | 10/16/90 | 4.7.01 | Responses to 90% Design comments (J. Seeger) |
| 213 | 10/18/90 | 3.6.3.09 | Ltr: Comments on Workplan for Final Remedy RI/FS (H. Lauer) |
| 214 | 10/25/90 | 3.2.03 | Draft Sample Collection & Analysis Plan (Dames & Moore) |
| 215 | 11/06/90 | 3.6.2.09 | Ltr: ADEQ, ADWR, EPA review of Final Remedy RI/FS Workplan (D. Atkinson) |
| 216 | 11/10/90 | 10.2.1 | Community Relations Plan revision (Dames & Moore) |
| 217 | 11/27/90 | 3.6.3.06 | Ltr: Comments on Sample Collection & Analysis Plan, Quality Assurance Plan, & Community Relations Plan (M. Montgomery) |
| 218 | 11/29/90 | 4.6.01 | Ltr: Dept. of Water Resources comments on 90% Design, Health and Safety Plan, Sampling & Analysis Plan (B. Davis) |
| 219 | 12/20/90 | 3.1.20 | Task Specification for Courtyard SVE Pilot-program (Dames & Moore) |
| 220 | 01/04/91 | 3.4.22 | Hydrologic Report in Support of Application for PQGWWP (Dames & Moore) |
| 221 | 01/14/91 | 10.2.3.03 | Memo: Comment on Community Relations Plan Revision (B. Mybeck) |
| 222 | 02/07/91 | 1.4.07 | Memo: Hydrology & CERCLA inspection (S. Calloway) |

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| 224 | 03/01/91 | 3.9.1.8.24 | Ltr: Memos on Central Phoenix Model (F. Putnam) |
| 225 | 03/27/91 | 3.3.5 | Supplement No. 1 Final Remedy RI/FS Workplan Plume Definition (Dames & Moore) |
| 226 | 03/28/91 | 3.6.2.06 | Memo: November 1990 Semi-annual Water Quality Report (C. Kafura) |
| 227 | 04/01/91 | 3.6.2.05 | Memo: November 1990 Semi-annual Water Quality Report & Supplement No. 1 to Final Remedy RI/FS Workplan (C. Kafura) |
| 228 | 04/04/91 | 3.5.9.09 | Final Remedy RI/FS Meeting notes (Dames & Moore) |
| 229 | 04/10/91 | 3.3.6 | Supplement No. 1 Final Remedy RI/FS Workplan Plume Definition Revision 2. (Dames & Moore) |
| 230 | 04/19/91 | 3.2.1.18 | Water Quality Data Usability Report, sampling rounds 8-14 (Dames & Moore) |
| 231 | 04/19/91 | 3.1.21 | Task Specification for Groundwater Quality Investigation Southwest Parking Lot (Dames & Moore) |
| 232 | 04/24/91 | 3.1.22 | Draft Operable Unit Monitor well Task Specification (Dames & Moore) |
| 233 | 05/15/91 | 3.9.1.8.20 | Ltr: Review of ADWR groundwater model (R. Brown) |
| 234 | 06/11/91 | 3.5.9.05 | Meeting notes |
| 235 | 06/17/91 | 3.1.23 | Draft Task Specification for Aquifer Testing (Dames & Moore) |
| 236 | 06/17/91 | 3.4.25 | Draft Well Installation Report (Dames & Moore) |
| 237 | 06/24/91 | 3.6.2.37 | Memo: Task Spec for Aquifer Testing (C. Kafura) |
| 238 | 07/08/91 | 3.9.1.8.16 | Ltr: Draft preliminary Groundwater Quality results plume definition program (Dames & Moore) |
| 239 | 07/11/91 | 3.6.2.03 | Memo: Draft Preliminary Groundwater Quality Results, Plume Definition Program (C. Kafura) |
| 240 | 09/30/91 | 3.4.26 | Draft Final Remedy Remedial Investigation Report (Dames & Moore) |
| 241 | 11/22/91 | 3.6.2.35 | Ltr: Draft Final Remedy RI report (D. Atkinson) |

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| 243 | 12/20/91 | 3.9.1.8.02 | Ltr: Contamination in Southwest corner of Motorola Property (R. Johns) |
| 244 | 01/28/92 | 3.2.1.26 | Operable Unit Baseline Data (Dames & Moore) |
| 245 | 02/01/92 | 3.2.06 | Final Sampling Plan-Soil Gas, Soil, & Ambient Air (Malcolm-Pirnie) |
| 246 | 02/01/92 | 3.4.28 | Final Remedy Remedial Investigation Report (Dames & Moore) |
| 247 | 02/04/92 | 6.2.01 | Dept. of Water Resources ARARs (K. Berry) |
| 248 | 02/04/92 | 1.2.02 | Memo: Groundwater Treatment Plant (L. Hammon) |
| 249 | 02/07/92 | 3.2.1.27 | Historical Lab Data 1987-1991 (Dames & Moore) |
| 250 | 02/18/92 | 3.2.1.28 | Historical Lab Data 8/85 to 12/86 (Dames & Moore) |
| 251 | 03/30/92 | 3.1.18 | Draft Task Specification Plume Definition (Dames & Moore) |
| 252 | 04/01/92 | 3.2.0.10 | Final Quarterly Groundwater Sampling Plan (Malcolm-Pirnie) |
| 253 | 04/01/92 | 3.4.31 | Operable Unit Baseline Report (Dames & Moore) |
| 254 | 04/07/92 | 3.6.2.3.9 | Ltr: Comments on Soil Gas, Soil Sampling and Testing Program (J. Maye) |
| 255 | 04/20/92 | 1.2.08 | Ltr: Response to ADEQ Inspection (G. Fisher) |
| 256 | 04/27/92 | 8.1.4.1 | Soil Gas Risk Assessment (ADHS) |
| 257 | 05/06/92 | 8.6.04 | Ltr: Comments on Baseline Risk Assessment (J. Maye) |
| 258 | 05/14/92 | 3.4.30 | Final Sampling Report Soil Gas, Soil Sampling Program (Malcolm-Pirnie) |
| 259 | 05/18/92 | 8.6.06 | Ltr: Comments on Baseline Risk Assessment (J. Zackrison) |
| 260 | 05/18/92 | 3.5.10.06 | Technical Committee Meeting Notes (J. Maye) |
| 261 | 05/21/92 | 3.5.10.07 | Technical Committee Meeting Notes (J. Maye) |
| 262 | 05/29/92 | 8.6.05 | Ltr: Comments on Baseline Risk Assessment (R. Hayslip) |
| 263 | 06/03/92 | 3.5.10.08 | Technical Committee Meeting Notes (J. Maye) |

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| 264 | 06/05/92 | 3.6.2.43 | Memo: Pre-design RI Workplan (K. Ross) |
| 265 | 06/08/92 | 3.4.28.1 | Responses to Comments of Final Remedy RI (Dames & Moore) |
| 266 | 06/08/92 | 3.7.29 | Responses to ADEQ Comments on Final Remedy RI Appendix F, Aquifer Tests (Dames & Moore) |
| 267 | 06/22/92 | 3.6.2.44 | Ltr: Review of Final Remedy RI (J. Maye) |
| 268 | 06/25/92 | 3.5.10.25 | Technical Committee Meeting Notes (J. Maye) |
| 269 | 06/29/92 | 3.6.3.39 | Ltr: Comment on Pre-Design RI Workplan (M. Montgomery) |
| 270 | 07/08/92 | 3.5.10.22 | Citizens Committee Meeting notes |
| 271 | 07/08/92 | 3.5.10.11 | Technical Committee Meeting Notes (J. Maye) |
| 272 | 07/15/92 | 3.3.8 | Pre-design RI Workplan (Dames & Moore) |
| 276 | 07/20/92 | 3.9.1.9.47 | Ltr: Proposed Ecological Risk Assessment (R. Weaver) |
| 274 | 07/23/92 | 3.5.10.15 | Technical Committee Meeting Notes (J. Maye) |
| 275 | 07/24/92 | 3.1.24 | Task Specification Groundwater Quality Investigation (Dames & Moore) |
| 276 | 07/31/92 | 3.4.36 | Quarterly Report Groundwater Sampling Round (Dames & Moore) |
| 277 | 07/31/92 | 3.4.34 | Quarterly Report Courtyard SVE Pilot Program (Dames & Moore) |
| 278 | 07/31/92 | 3.4.37 | Pre-design RI Status (Dames & Moore) |
| 279 | 07/31/92 | 3.4.35 | Quarterly Report Southwest Parking Lot Investigation of VOC Discharges (Dames & Moore) |
| 280 | 08/03/92 | 3.1.24.1 | Revised Task Specification Groundwater Quality Investigation (Dames & Moore) |
| 281 | 08/06/92 | 3.5.10.18 | Technical Committee Meeting Notes (J. Maye) |
| 282 | 08/10/92 | 3.6.2.46 | Ltr: Approval of Pre-Design RI Workplan (J. Maye) |
| 283 | 08/20/92 | 3.5.10.27 | Technical Committee Meeting Notes (J. Maye) |
| 284 | 08/24/92 | 3.4.36.1 | Memo: Quarterly Report Groundwater Sampling Round (M. Castaneda) |

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| 285 | 08/25/92 | 3.5.10.26 | Technical Committee Meeting Notes (J. Maye) |
| 286 | 09/23/92 | 3.4.43 | Draft In-situ Air Sparging/SVE system Field Test SWPL (Dames & Moore) |
| 287 | 09/25/92 | 3.5.10.32 | Technical Committee Meeting Notes (J. Maye) |
| 288 | 09/25/92 | 3.9.1.9.67 | Memo: ARARs from Dept. of Water Resources (D. Annis) |
| 289 | 09/25/92 | 3.9.1.9.61 | Ltr: ARARs from Region IX (M. Montgomery) |
| 290 | 10/20/92 | 3.2.1.40 | Motorola 52nd Street/East Washington Sweep Sample results (M. Castaneda) |
| 291 | 10/20/92 | 6.2.04 | Potential ARARs (J. Maye) |
| 292 | 10/30/92 | 3.4.38 | Quarterly Report, October 1992 (Dames & Moore) |
| 293 | 11/01/92 | 3.4.40 | Baseline Risk Assessment (Arizona Department of Health Services) |
| 294 | 11/09/92 | 3.1.25 | Pumping Test Task Specification (Dames & Moore) |
| 295 | 11/12/92 | 3.9.1.9.79 | Technical committee meeting notes (J. Maye) |
| 296 | 11/30/92 | 3.2.1.37 | Motorola 52nd Street/East Washington 1st Sweep sample Groundwater Elevation Data (M. Castaneda) |
| 297 | 12/09/92 | 3.5.10.39 | Technical meeting handouts - Proposed final remedy alternatives |
| 298 | 12/10/92 | 3.9.1.11.3 | AlliedSignal response to General Notice Letter (P. Li) |
| 299 | 01/04/93 | 7.7 | ITT Cannon response to General Notice Letter (N. Singh) |
| 300 | 01/06/93 | 3.5.11.4 | Technical Committee Meeting Notes & handouts |
| 301 | 01/20/93 | 3.9.1.10.03 | Ltr: Comments on draft Ecological Risk Assessment (D. Walker) |
| 302 | 01/24/93 | 4.2.6 | Tables for Screening Analysis of Alternatives (Dames & Moore) |
| 303 | 01/26/93 | 3.5.11.2 | Technical Committee Meeting Notes |
| 304 | 01/27/93 | 4.2.7 | Tables for FS alternatives (Dames & Moore) |
| 305 | 01/29/93 | 3.4.41 | January 1993 Quarterly Report (Dames & Moore) |
| 306 | 02/01/93 | 3.2.1.42 | Draft Final Report Investigation of Inorganic Contaminants (Dames & |

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| 308 | 02/08/93 | 3.4.23 | Bedrock Data Report (Dames & Moore) |
| 309 | 02/17/93 | 3.9.1.10.9 | Ltr: Tiernay Turbines reponse to General Notice Letter (J. Dubbs) |
| 310 | 02/19/93 | 3.9.1.10.4 | Ltr: Comments on Screening Analysis of Alternatives (M. Montgomery) |
| 311 | 02/20/93 | 3.1.26 | Task Spec for in-situ Air Sparging/SVE system field test (Dames & Moore) |
| 312 | 02/26/93 | 3.4.41.1 | Quarterly Report Supplement (Dames & Moore) |
| 313 | 03/01/93 | 3.6.2.48 | Ltr: Comments on Screening Analysis of Alternatives (J. Kulon) |
| 314 | 03/02/93 | 3.5.11.8 | Technical Committee Meeting Notes |
| 315 | 03/22/93 | 4.5.2 | Ltr: Detailed Analysis of Alternatives (J. Kulon) |
| 316 | 03/23/93 | 3.5.11.7 | Technical Committee Meeting Notes |
| 317 | 04/01/93 | 8.1.6 | Ecological Risk Assessment (SAIC) |
| 318 | 04/01/93 | 3.2.1.42.1 | Summary Report-Review of Investigation of Inorganic Contaminants in Groundwater (PRC) |
| 319 | 07/20/93 | 3.2.1.46 | Groundwater Monitoring Plan for 4/93 to 3/94 (Dames & Moore) |
| 320 | 04/02/93 | 3.2.0.14 | Pilot Scale Test Results UV Oxidation Technology (GPI) |
| 321 | 04/16/93 | 3.6.2 | Ltr: Comments on Investigation of Inorganic Contaminants in Groundwater (J. Kulon) |
| 322 | 04/28/93 | 3.4.42 | Quarterly Report, April 1993 (Dames & Moore) |
| 323 | 05/01/93 | 3.4.46 | Operable Unit Effectiveness Report (Dames & Moore) |
| 324 | 05/01/93 | 3.4.45 | Southwest Parking Lot RI Report (Dames & Moore) |
| 325 | 05/20/93 | 3.2.0.15 | Southwest Parking Lot Remediation Operation (Dames & Moore) |
| 326 | 05/21/93 | 3.9.1.10.37 | Ltr: request to temporarily stop Operable Unit One (D. Netko) |
| 327 | 05/28/93 | 3.2.0.13 | Draft Detailed Analysis of Alternatives (Dames & Moore) |

SUPPLEMENT #1

ADMINISTRATIVE RECORD INDEX

MOTOROLA 52ND STREET SITE

| Document Number | Date | ADEQ File # (4070.-) | Description |
|-----------------|----------|-------------------------|--|
| 328 | 05/28/93 | 3.9.1.10.38 | Ltr: Modelling meeting on 5/21/93 (Dames & Moore) |
| 329 | 05/28/93 | 3.2.1.47 | Revised Technical Memorandum Transport Calibration (Dames & Moore) |
| 330 | 07/02/93 | 3.5.11.13 | Technical Committee Meeting Notes |
| 331 | 07/06/93 | 3.5.11.16 | Ltr: Issues from 6/22/93 PRP Coordination Meeting (J. Kulon) |
| 332 | 07/08/93 | 3.9.1.10.39 | Ltr: Comment on draft Detailed Analysis (M. Montgomery) |
| 333 | 07/20/93 | 3.2.1.46 | Groundwater Monitoring Plan April 1993 to March 1994 (Dames & Moore) |
| 334 | 07/21/93 | 3.5.11.13 | Technical Committee Meeting Notes & handouts |
| 335 | 07/30/93 | 3.4.48 | Quarterly Report, July 1993 (Dames & Moore) |
| 336 | 08/01/93 | 4.2.8 | Draft Interim Remedy Feasibility Study Report (Dames & Moore) |
| 337 | 08/03/93 | 3.3.8.1 | Addendum to the Pre-design RI Workplan (Dames & Moore) |
| 338 | 08/04/93 | 3.9.3.189 | Memo: Comments on Southwest Parking Lot RI Report (K. Ross) |
| 339 | 08/19/93 | 3.6.2.51 | Ltr: Southwest Parking Lot Remedial Investigation Report (J. Kulon) |
| 340 | 08/19/93 | 3.6.2.50 | Ltr: Southwest Parking Lot Operations Report (J. Kulon) |
| 341 | 09/03/93 | 3.9.1.11.1 | Ltr: Interim Adjustment to Integrated Groundwater Treatment Plant (D. Netko) |
| 342 | 09/11/93 | 3.3.9 | Workplan Southwest Parking Lot RI (Dames & Moore) |
| 343 | 09/16/93 | 3.9.1.11.2 | City of Phoenix Response to General Notice Letter (P. Manion) |
| 344 | 10/02/93 | 3.2.1.50 | Aquifer Test Report, Well DM-518 (Dames & Moore) |
| 345 | 10/1/93 | 3.6.2.49 | Ltr: Comment on Draft Interim Remedy FS (J. Kulon) |
| 346 | 10/14/93 | 3.6.2.52 | Ltr: Comments on Operable Unit Effectiveness Report (J. Kulon) |
| 347 | 10/20/93 | 3.9.1.10.42 | Ltr: Dept. of Water Resources comment on Draft Interim Remedy FS (D. Annis) |
| 348 | 10/23/93 | 3.4.49 | Quarterly Report, October 1993 (Dames & Moore) |

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ADMINISTRATIVE RECORD INDEX

MOTOROLA 52ND STREET SITE

| Document Number | Date | ADEQ File # (4070.-) | Description |
|-----------------|----------|-------------------------|---|
| 349 | 10/25/93 | 3.4.50 | Motorola 52nd Street Site Review and Update (ATSDR) |
| 350 | 10/27/93 | 3.1.28 | Task Spec Southwest Parking Lot RI supplemental drilling program (Dames & Moore) |
| 351 | 10/29/93 | 4.2.9 | Interim Remedy Feasibility Study Report (Dames & Moore) |
| 352 | 11/05/93 | 3.5.12.2 | Ltr: Summary of 10/14/93 Coordination Meeting (J. Kulon) |
| 353 | 11/09/93 | 3.2.1.42.2 | Responses to Comments on Investigation of Inorganic Contaminants (Dames & Moore) |
| 354 | 11/10/93 | 3.9.1.10.41 | Ltr: City of Phoenix position on accepting treated water (S. Meade) |
| 355 | 11/24/93 | 3.5.12.3 | Ltr: Summary of 11/15/93 Coordination Meeting (J. Kulon) |
| 356 | 12/06/93 | 3.9.3.190 | Memo: Review of draft Aquifer Test Well DM-518 (K. Ross) |
| 357 | 12/10/93 | 4.2.9.1 | Supplement to the Interim Remedy Feasibility Study (Dames & Moore) |
| 358 | 01/01/94 | 10.2.4 | Proposed Community Involvement Plan Revision (ADEQ) |
| 359 | 01/05/94 | 10.6.3.17 | Proposed Plan For the Motorola 52nd Street Superfund Site - Winter 1992 Factsheet (ADEQ) |
| 360 | 01/11/94 | 3.6.6.11 | Comments on Proposed Plan & Feasibility Study (Mr. Barella) |
| 361 | 01/14/94 | 3.9.1.11.4 | Ltr: Operation of OU1 after adjustments (J. Sherer) |
| 362 | 01/21/94 | 3.5.12.1 | Ltr: Summary of 12/8/93 Coordination Meeting (J. Kulon) |
| 363 | 01/31/94 | 3.4.51 | Quarterly Report, January 1994 (Dames & Moore) |
| 364 | 02/03/94 | 3.5.12.4 | Transcripts: 2/3/94 Public Meeting for Proposed Plan (Cahn & Blain) |
| 365 | 02/18/94 | 3.2.1.49 | Results of Hydrogeologic investigation of Subsurface Bedrock Conditions (Errol Montgomery Assoc.) |
| 366 | 03/03/94 | 3.6.6.10 | Tiernay Turbines Comments on Proposed Plan & Feasibility Study (J. Dubbs) |
| 367 | 03/07/94 | 3.6.5.3 | Salt River Project Comments on Proposed Plan & Feasibility Study (R. Hayslip) |
| 368 | 03/28/94 | 3.9.3.191 | Memo: East Washington Area Isoconcentration Contours for the Bedrock |

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MOTOROLA 52ND STREET SITE

| Document Number | Date | ADEQ File # (4070.-) | Description |
|--------------------|----------|-------------------------|--|
| | | | Portion of the Aquifer (K. Ross) |
| 369 | 04/05/94 | 3.6.6.9 | City of Phoenix Comments on Proposed Plan & Feasibility Study (K. O'Regan) |
| 370 | 04/06/94 | 3.6.6.4 | Gateway Neighbors comment on the Proposed Plan and Feasibility Study (C. Wheeler, et. al.) |
| 371 | 04/06/94 | 3.6.6.5 | Dames & Moore Comments on Proposed Plan & Feasibility Study (J. Hussey) |
| 372 | 04/06/94 | 3.6.6.6 | ITT Cannon Comments on Proposed Plan & Feasibility Study (L. Narducci) |
| 373 | 04/06/94 | 3.6.6.7 | AlliedSignal Comments on Proposed Plan & Feasibility Study (D. Reese) |
| 374 | 04/06/94 | 3.6.6.8 | Motorola Comments on Proposed Plan & Feasibility Study (D. Netko) |

APPENDIX B.

Responsiveness Summary

MOTOROLA 52ND STREET, PHOENIX, ARIZONA RESPONSIVENESS SUMMARY

A. OVERVIEW

The Arizona Department of Environmental Quality (ADEQ) identified a preferred alternative for a second interim remedy, Operable Unit Two (OU2), to provide additional containment of contaminated groundwater at the Motorola 52nd Street Site. ADEQ's preferred alternative involved extraction of groundwater in the vicinity of Interstate 10 and Van Buren Street. Treatment of the extracted water for volatile organic compounds (VOCs) would be accomplished by either air stripping with synthetic resin filtration of off-gases or advanced oxidation technology. The treated water would be reinjected into the ground.

Judging from comments received during the public comment period, the community and Potentially Responsible Parties (PRPs) supported the idea of additional plume containment. Both the community and the PRPs (except Motorola) felt that the proposed location for groundwater extraction was questionable due to incomplete hydrogeologic characterization and unclear effects of pumping on other sources of contamination. Motorola concurred with the selection of extraction near Interstate 10, but preferred Alternative 64C over 64R. The community and some PRPs preferred groundwater extraction locations associated with Alternative 11 near the Grand Canal, where better hydrogeologic characterization exists, and no other identified sources of contamination exist. AlliedSignal recommended a combination of the preferred alternative and Alternative 11.

These sections follow:

- Background on Community Involvement
- Summary of Comments Received During the Public Comment Period and Agency Responses
 - Part I: Summary and Response to Local Community Concerns

| | |
|---------------------------------|-------------------------------------|
| General and procedural comments | Interim remedy alternatives |
| Other known and unknown sources | Additional options for alternatives |
| Public health concerns | |
 - Part II: Comprehensive Response to Specific Legal and Technical Questions

| | |
|-------------------------------|---|
| Amount and quality of data | The FS and comparison of alternatives |
| Technology concerns | National Contingency Plan |
| The FS model | Applicable or Relevant and Appropriate requirements |
| ADEQ contaminant contour maps | Other legal concerns |
- Remaining Concerns
- Attachments: Community relations activities since December 1991.
 - Figure - Predicted drawdown for Alternatives 64C/64R

B. BACKGROUND ON COMMUNITY INVOLVEMENT

The Motorola 52nd Street site has received a high level of community interest since the beginning of investigations in 1983. Before the completion of Operable Unit One (OU1), Motorola had the primary responsibility for community involvement. Newsletters were created by Motorola in the early stages of the investigation. Due to community concerns about the reliability of data coming from Motorola, ADEQ assumed the responsibility for community involvement after OU1.

An attachment shows a list of events ADEQ conducted between late 1991 and Summer 1994, including fact sheets, open houses, community meetings, citizens committee meetings, and less-formal events in neighborhood homes. One neighborhood group, the Gateway Neighborhood Coalition, is the recipient of a Technical Assistance Grant for the site. Through the Gateway Neighbors, and events in the community, ADEQ has recognized some common concerns about remedial activities at the site:

- 1) Citizens contend that a number of potential contaminant sources are not being factored into risk calculations and remedial action decisions. These include air emissions from manufacturing processes and VOC vapors in the sewer system.

ADEQ response: ADEQ recognizes the presence of these potential sources, however air emissions from manufacturing are beyond the scope of CERCLA response authority for this National Priorities List site. ADEQ has suggested contact with Maricopa County for these concerns. The County is the primary agency regulating air emissions. Sewer odors are also beyond the scope of this project, however the City of Phoenix has recently conducted a number of activities to reduce sewer odors. The City sealed manholes in the area, and then unsealed them at the request of the community after unsatisfactory results. The City also installed a type of flapper valve system in the sewers to allow wastewater to flow, but not allow vapors to back up.

- 2) Citizens also contend that specific data from private wells has not been accounted for in risk calculations.

ADEQ response: The Baseline Risk Assessment prepared by the Arizona Department of Health Services is designed to estimate current and potential future risks associated with contaminants at the site. Some private well data were not included since the wells are not in current use and are not expected to be used in the future. Studies conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) in 1988 and 1993 were designed to assess cumulative effects of all potential environmental factors in the community.

C. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

The public comment period for the draft Feasibility Study (FS) and the Proposed Plan for Operable Unit Two at the Motorola 52nd Street site was held from January 5, 1994 to April 6, 1994. Comments received during this time are summarized below. Part I of this section addresses those community concerns and comments that are non-technical in nature. Responses to specific legal and technical questions are provided in Part II. Comments in each part are categorized by relevant topics.

Part I - Summary and Responses to Local Community Concerns

General and procedural comments

- 1) A citizen at the public meeting asked a general question regarding the need for an appointment to review ADEQ's files on this project.

ADEQ response: An appointment is preferred. Many people are interested in reviewing this project's files specifically. Due to space limitations, ADEQ can only accommodate a small number of people at one time. Many people request that sections of the file be copied for them, which may require files to be sent out to a copy company. An appointment will ensure that the desired portions of the file are available. Please contact Julie Jones at (602)207-4190 for an appointment. Be advised that ADEQ charges 25¢ per page for copying. Major recent documents for this project can also be found at the Saguaro Branch Library at 2802 N. 46th Street.

- 2) A citizen at the community meeting commented that the community involvement plan did not adequately describe the number of people that live in the area.

ADEQ response: A primary purpose of the community involvement plan is to identify community concerns and plan the types of activities that will be necessary to properly involve the community in the process. In that context, it is important to know that groups requiring information in languages other than English reside in the area. The current Community Involvement Plan specifies that approximately 6,800 monolingual Spanish speakers live in the area of the NPL site. The Community Involvement Plan is not an attempt to accurately estimate the total number of people residing in the area. Also, see comment number 4 under the "Public Health Concerns" category.

- 3) A citizen at the public meeting had also been to a meeting for the Motorola 56th Street site on December 14, 1993. He had concerns that written responses that were promised as a result of that meeting had not yet been provided.

ADEQ response: The written responses were completed and supplied to the Gateway Neighborhood Coalition on March 25, 1994. A copy of that document is in ADEQ's

project files and is also placed in the information repository at the Saguaro Branch Library.

- 4) A citizen at the community meeting expressed concerns regarding the timing of the meeting. Many people forget if the meeting is held two or three weeks after it is announced. The citizen recommended that PRPs put some of their advertising budget toward additional meeting announcements.

ADEQ response: The time between the announcement of the Proposed Plan and the actual meeting was intended to allow the community an opportunity to review information about the site to make informed comments. The Gateway Neighborhood Coalition is one avenue ADEQ will use to keep the community aware. ADEQ also has an Automated Information Line that provides information on upcoming meetings and other items. The phone number is 207-4300. The citizen suggested that additional notices should be placed by the PRPs. No regulatory requirement exists to force PRPs to do this, but some may volunteer.

- 5) AlliedSignal commented that trichloroethane (TCA) contamination emanating from their facility exceeds the EPA Maximum Contaminant Level (MCL) only within the boundaries of their facility.

ADEQ response: Available data support this observation, however it does not take into account the degradation (or breakdown) that TCA undergoes once it is in the groundwater. When TCA breaks down in the environment, it becomes 1,1-dichloroethylene (1,1-DCE). This is especially true in Arizona's alkaline soils. ADEQ's evaluation of groundwater quality data indicates a plume of 1,1-DCE above the MCL beginning at the AlliedSignal facility and extending to at least 16th Street. After more time in the environment, 1,1-DCE breaks down to become vinyl chloride, a known human carcinogen. Vinyl chloride has been detected above MCLs in wells at AlliedSignal.

Other known and unknown sources

- 1) The Gateway Neighborhood Coalition (GNC), AlliedSignal (Allied), Tiernay Turbines (Tiernay), the City of Phoenix (COP), and ITT Cannon (ITT) have expressed a concern that the preferred alternative would merge contaminant plumes from other sources and that there may be unknown chemicals in those plumes which will not be remediated by the proposed treatment method. This concern was also presented by a citizen at the public meeting. Motorola commented that technical data do not indicate the presence of contaminants beyond the abilities of the preferred remedy, and that capture of contaminants from other upgradient sources is an advantage of the Alternatives 64C and 64R.

ADEQ response: Through various investigations, ADEQ has identified a number of potential sources of groundwater contamination at this site. In mapping contamination across the East Washington Water Quality Assurance Revolving Fund investigation area, just west of the Motorola plant, ADEQ has determined that one continuous area of volatile organic compound (VOC) contamination exists from 52nd Street to 7th Avenue and beyond. ADEQ considers the sources, known and unknown, to already be merged since the contamination consistently occurs across the area. Groundwater sampling during many years of investigations has not identified any contaminants that would be incompatible with treatment technologies in the preferred interim remedy alternative. Groundwater monitoring will continue during the remedial design phase of the project to ensure that incompatible substances are identified. The treatment system will be modified if necessary.

- 2) The COP identified the West Sky Harbor Fuel Remediation site as one effort that may be impacted by the preferred remedy.

ADEQ response: The potential changes in groundwater flow direction and/or velocity are not expected to have significant adverse effect on remediation of other sources or plumes, including the Sky Harbor Fuel Remediation site. Groundwater pumping as part of this interim remedy is expected to increase groundwater flow velocity by 10 to 20 percent within 3000 feet of the extraction wells (see attached figure 1 for impacted areas). The Sky Harbor Fuel Remediation site is farther than 3000 feet from the extraction well locations, so the impacts on that particular site would be even less. ADEQ and EPA will continue to evaluate those issues during design and implementation of the selected remedy.

- 3) The COP, the GNC, and Allied recognized the contamination from the Motorola plant at 56th Street and Earll as another source potentially impacted by this interim remedy. The GNC and Allied suggest that Alternative 11 would help to control that source as well.

ADEQ response: Groundwater contamination from the Motorola 56th Street site is a distinctly separate plume being addressed under Arizona's Water Quality Assurance Revolving Fund (WQARF) program. At its current rate of movement, and if no action is taken, the plume from the 56th Street plant would require at least 5 to 6 years before it would begin to combine with the NPL site plume. If no action were taken on the Motorola 56th Street site plume, Alternative 64R would capture that contamination. ADEQ expects to identify appropriate remedies for the 56th Street plume within a year. Potentially including this separate plume in the National Priorities List site is not desirable and may tend to complicate and extend the remediation.

- 4) The GNC and the COP identified potential impacts of the interim remedy on the ability of the PRPs to adequately complete their respective site characterization work.

ADEQ response: Source characterizations are on-going at Tiernay Turbines, AlliedSignal, and ITT Cannon. After the Record of Decision for OU2 is complete, several months of formal negotiations will take place to create a consent decree for the design and construction of OU2. The design stage will take nine months to a year to complete, and the construction schedule will depend largely on the design. Therefore, the PRPs will have 18 months, at a minimum, to continue their source characterization activities. If that work can be completed with a minimum of obstacles, source characterization should be complete in that time.

- 5) The GNC identified silicon slurry beds on the Motorola plant as a potential source not accounted for in the FS. A citizen at the public meeting also expressed concern that the neighbors had not directly been notified of the presence of the silicon slurry beds, and suggested that a centralized Bulletin Board System would allow access to this type of information.

ADEQ response: The silicon slurry beds recently went through closure procedures under ADEQ's Aquifer Protection Permit program. That program has indicated that clean-closure has been attained, therefore it is unlikely that this area would be a continuing source of contaminants. The location of the silicon slurry beds is inside the area captured by OU1, therefore any potential releases from the beds would be captured by the existing treatment system. The citizen's suggestion during the public meeting that a centralized bulletin board system be developed is very good and is under consideration by ADEQ management.

- 6) The GNC identified sewage ponds at 48th Street south of the Grand Canal as another potential source of contamination not accounted for in the FS. These ponds reportedly received wastewater from the Motorola 52nd Street plant.

ADEQ response: Groundwater investigations across the East Washington WQARF area do not indicate that a source of organic or inorganic contaminants exists in that area. The City of Phoenix was contacted regarding sewage ponds in the area, and were not able to confirm their existence. The City suggested that the ponds may have been for stormwater retention and not sewage.

- 7) The GNC identified leaking sewers, which carry Motorola industrial wastewater discharges, as a potential source not accounted for in the FS.

ADEQ response: Maintenance of the sewer system and permitting of discharges are the responsibility of the City of Phoenix. Regular maintenance procedures conducted by the City include video inspections every four to five years, and these activities have not caused the City to believe the pipes are leaking.

- 8) The COP commented that requirements of the Resource Conservation and Recovery Act (RCRA) Subtitle C were not identified as ARARs, and that commingling of plumes could

trigger costly RCRA requirements that would not otherwise be ARARs.

ADEQ response: Existing data suggest that plumes from several sources have already become commingled; regardless, the selected remedial activity involves pumping and treating groundwater containing several VOCs, including TCE (a listed waste in this case). Therefore, RCRA Subtitle C storage/treatment requirements are ARARs for groundwater storage/treatment. Once the groundwater is treated to a health-based standard, it is considered to no longer contain hazardous waste and no longer is subject to RCRA requirements.

Public health concerns

- 1) The COP found no correlation between the Baseline Risk Assessment and this interim remedy. Also, the COP recommends that the risk assessment be expanded to cover the entire site.

ADEQ response: The Arizona Department of Health Services (ADHS) completed the Baseline Risk Assessment in November 1992 to cover the area that was being considered for a final remedy at that time. That area is shown in Figure 4 of the Record of Decision. ADEQ agrees with the COP that the risk assessment needs to be expanded and will work with ADHS as new data is collected. While the entire contaminated area is not included in the Risk Assessment, all of the potential exposure scenarios are addressed. This interim remedy is not intended to meet all health-based and regulatory goals, but to reduce the spread of contamination until a remedy that can meet those goals is defined. EPA guidance does not require the Risk Assessment to be complete before interim action is taken.

- 2) The COP and Tiernay expressed a concern that the FS did not consider that implementing an interim remedy would expose the community to contamination (via air emissions from air strippers) that they are not currently exposed to.

ADEQ response: The FS did determine that untreated air stripper emissions would violate federal or county standards. Treatment of air stripper emissions has been included as part of the remedy to reduce those emissions to levels permissible by Maricopa County. Quantitatively modeling and determining exposure and risk from emission of 3 pounds per day (the level beyond which treatment to reduce emissions is required) is not practical, but the health risks from such a small emission would certainly be less than would be required to produce adverse health effects. For comparison, according to the Maricopa County Bureau of Air Pollution Control, the average dry cleaner in Maricopa County emits (under permit) approximately 4.5 pounds per day of tetrachloroethylene, or PCE. This amount also would be less than required to produce adverse health effects.

- 3) The GNC commented that public health concerns, in terms of inorganic contaminants, were not given sufficient weight in selecting alternatives. Potential impacts of leaving inorganic contamination in place needs to be considered.

ADEQ response: Inorganic contaminants are not treated by the preferred interim remedy. Since there is no current exposure to groundwater contaminants, leaving inorganic contaminants in place until a final remedy is identified does not increase current or potential exposure risks. This interim remedy will not adversely impact the ability to remove the inorganic contaminants in the future.

- 4) The GNC commented that the potentially impacted population was not adequately characterized in the FS, in terms of numbers of people, houses, schools, etc., and therefore evaluating effectiveness of alternatives is not possible. This concern was also expressed by a citizen at the public meeting.

ADEQ response: The Baseline Risk Assessment estimated potentially exposed populations using census tract information. Risk is evaluated in terms of increased risk to individuals, not the total number of people at risk. Similarly, remedial alternatives are evaluated based on effectiveness in addressing potential exposure to contamination, not on the basis of total number of people potentially exposed. Estimates of potentially exposed populations were made in the early stages of the Superfund process. The Preliminary Assessment and Site Investigation phases assessed potentially exposed populations in order to determine whether the site was eligible to become a National Priorities List site. These documents are part of the Administrative Record on which this interim remedy decision was based.

- 5) A citizen at the public meeting also asked how the proposed containment plan protects people from risk during construction.

ADEQ response: Risks during construction of the interim remedy are limited to those associated with construction activities. Exposure to groundwater contaminants is unlikely unless direct exposure to groundwater during the drilling of necessary wells occurs. Standard safety procedures will be employed during construction activities to limit public access to areas where exposure might occur.

- 6) A citizen at the public meeting stated that he had been exposed to contaminants from the Motorola plant in the past and had concerns that his mental health had been impacted, and that friends of his were now either dead or in prison due to mental health problems.

ADEQ response: ADEQ consulted the Arizona Department of Health Services regarding this concern. Studies of workers occupationally exposed to high levels of TCE for long periods have not found a relationship between exposure to TCE and mental illness.

- 7) A citizen commented that other visible signs of water, soil, and air contamination exist, such as lack of birds and insects, and deformities in cats and dogs.

ADEQ response: ADEQ has no data that would link these conditions to the Motorola 52nd Street Superfund site. An ecological risk assessment for the site was completed in April 1993, which concluded that no threatened or endangered species occur in the area. The assessment concluded that there is little concern regarding exposure of ecological receptors, with the exception of levels of arsenic and lead above aquatic freshwater criteria in SRP irrigation well 18E-5N (which feeds the Grand Canal). SRP currently uses water from Arizona's reservoir system to supply irrigation water.

Interim Remedy Alternatives

- 1) The COP and the GNC commented that Alternative 11 is the only alternative to treat inorganic contaminants, and have concerns that the preferred alternative doesn't. A citizen at the public meeting asked "How does proposed Alternative No. 64 contain inorganics such as fluoride between 46th Street and the bedrock high area?" Motorola commented that treatment for inorganics is not the main purpose of this interim remedy.

ADEQ response: The primary goal of this interim remedy is containment or control of the movement of the VOC contaminant plume. Inorganic treatment is a component of Alternative 11 because fluoride levels in that area would prohibit reinjecting the water back into the ground if not treated. In the area where extraction is located in the preferred alternative, inorganic contaminants do not occur at levels which would require treatment before reinjection. The selected remedy will not preclude any future treatment of inorganics. If inorganics reach the proposed extraction location at concentrations high enough to require treatment, the treatment system can be modified to remove inorganics. Alternatively, it would be possible at some future date to install supplemental facilities for capturing and treating inorganic contaminants at a location closer to the Motorola plant where such treatment would be more efficient due to higher concentrations.

- 2) The COP considers the selection of Alternative 64R a contradiction to remedial action objectives identified in the FS, specifically the goal of treating extracted water for VOC and inorganic contaminants. Motorola commented that containment is achieved by Alternatives 64C and 64R better than the others, that they are more effective at reducing contaminant concentrations, and provide containment of several identified, uncontrolled contaminant sources.

ADEQ response: The FS states that the primary goal is to contain the migration of VOCs. Treatment for inorganics is not a universal goal of this interim remedy. Removal of contaminants in extracted water will be necessary prior to disposal. Extraction of groundwater in the area specified for Alternative 64R will attain the goal of containing the migration of contaminants, and treatment for inorganics will not be

necessary since inorganics above regulatory standards do not occur in the area.

- 3) The COP and Tiernay expressed a concern that it is not known how this interim remedy will be incorporated with the final remedy.

ADEQ response: Containment of contaminants as part of this interim remedy will inhibit the further movement of contaminants while continuing to characterize the site and appropriate remedies researched. While it is not possible to know precisely what role this interim remedy will play in the final remedy, ADEQ believes OU2 will be compatible with the probable final remedy options that might be proposed.

- 4) The COP and Motorola commented that it is unclear why Alternative 64R with reinjection of treated water was selected since Alternative 64C, with discharge to irrigation canals, is less expensive and more easily implemented. Motorola contends that reinjection of the treated water is not crucial to the success of the remedy, and that discharge to the canals provides a more immediate beneficial use of the treated water.

ADEQ response: Discharge to the Grand Canal is not preferred because access to the canals may be erratic due to maintenance and irrigation water demand considerations. Reinjection of the treated water provides a more reliable method of treated water use. The potential for a combination of these two options will be evaluated during the remedial design. Also, the potential for bioremediation to assist in actual restoration of contaminated groundwater is being researched. If bioremediation is determined to be effective, this could be easily implemented using the injection wells associated with Alternative 64R. Any decision in this regard would not be made until the public has an opportunity to comment.

- 5) The COP expressed a concern regarding the location of injection wells in relation to remediation efforts at the Sky Harbor Fuel Remediation site. The comment also requested specific design information.

ADEQ response: The precise location and design of reinjection wells will be determined during the design of the interim remedy system. It is not anticipated that the interim remedy will adversely affect the efforts at the fuel remediation site, however such impacts will be considered and addressed as necessary during remedy design.

- 6) The COP and Motorola commented on the amount of public disruptions involved with the alternatives. The COP feels that not enough study has been done on the feasibility of 19 street crossings and 24,000 feet of piping under the preferred alternative.

ADEQ response: Detailed design considerations such as these will be addressed during the design of this interim remedy. ADEQ and EPA do not consider this factor significant enough to change the selected remedy, however the potential to combine discharges of treated water to the Grand Canal with reinjection will be examined during

remedial design to possibly reduce disruptions. Consultation with the communities potentially impacted by construction will begin early in the design process.

- 7) Allied commented that the area influenced by the preferred remedy is so vast that it cannot accomplish its objectives.

ADEQ response: Allied presented no technical justification for this opinion. ADEQ is confident in its understanding of the site conditions and the ability to design a system capable of accomplishing the objective of containing VOC movement.

- 8) The GNC commented that the preferred alternative does nothing to remediate contamination in bedrock east of the Grand Canal. The GNC prefers Alternative 11 since it captures both bedrock and alluvium contamination in an area historically described as containing a significant amount of contamination.

ADEQ response: The GNC is correct that the preferred alternative will not affect contamination in bedrock east of the Grand Canal. The final remedy for the site will necessarily address this concern. Movement of bedrock contamination east of the Grand Canal during this interim remedy is not expected to preclude its capture as part of the final remedy. In the comments from the GNC, references were made to reports prepared by Motorola in 1983 suggesting the area near the Grand Canal contains significant amounts of contamination. ADEQ considers contamination above EPA Maximum Contaminant Levels (MCLs) to be significant. Current groundwater quality information across the Phoenix area suggests levels of VOC contamination exist above MCLs as far west as 75th Avenue, therefore, the volume of contaminated groundwater east of the Grand Canal is significantly greater than the volume of contaminated groundwater between OU1 and the Grand Canal.

- 9) The GNC commented that reverse osmosis technology was removed from consideration for inorganics treatment early in the FS process without detailed explanation.

ADEQ response: The discussion of reverse osmosis occurs in the FS in section 4.5.2. Activated alumina was selected as the technology for inorganic treatment because it selectively reduces fluoride and arsenic concentrations. It is also considerably less expensive than reverse osmosis - reverse osmosis is estimated to cost \$1.37 per 1000 gallons of water treated, while activated alumina would cost \$0.38 per 1000 gallons.

- 10) Salt River Project, a water purveyor, commented that discharges to the Grand Canal may be periodically interrupted due to maintenance, or irrigation demand less than the capacity of the extraction wells.

ADEQ response: ADEQ is aware of the potential for sporadic interruptions in the availability of the canals as a discharge option. This is one reason that canal discharges were not a preferred component of this interim remedy.

- 11) Salt River Project expressed a concern regarding the ability to track the amounts of treated water discharged into the canals.

ADEQ Response: Based on design considerations, OU2 may include a combination of reinjection and discharge of treated water to canals. Some manner of flow metering will be required in the design to track the amounts of water treated. Salt River Project's concerns could also be addressed by requiring measurement of the amount of water discharged to the canal system.

- 12) Salt River Project disagrees with a statement in the FS that Grand Canal water is naturally of lower quality.

ADEQ response: ADEQ could not find the reference in the FS, but appreciates the clarification. The statement was not intended to be derogatory.

- 13) Salt River Project identified seven irrigation wells that supply water to the Grand Canal which may be affected by the contamination and the interim remedy.

ADEQ response: Two of the seven wells, well 18E-5N near 40th Street and Van Buren and well 16.9E-6N near 32nd Street and McDowell, may be affected due to their proximity to the contaminant plume. When pumping, those wells will need to be monitored for water quality and potential impacts on plume movement. Coordination with Salt River Project regarding times and rates of pumping of the irrigation wells will be important in understanding the effects of this pumping on the contamination and the interim remedy.

- 14) At the public meeting, a citizen commented that some alternatives which treated inorganics, and included bioremediation, were removed from consideration early in the process. Specific alternatives identified were alternatives 29, 35, and 62.

ADEQ response: The alternatives identified were researched during the search for a final remedy. When ADEQ and EPA decided that a final remedy was not possible at this time, the list of potential alternatives was reduced to those "final remedy" alternatives that might make appropriate interim remedies. Alternatives 29, 35, and 62 all consisted of two or more lines of containments wells, one of which is located near the bedrock ridge. From preliminary cost estimates during initial screening of alternatives, the least expensive of these alternatives was approximately \$50 million. Even if these alternatives had been carried forward for further consideration, the impacts of the bedrock ridge on those alternatives would have rendered them ineffective.

- 15) A citizen at the public meeting commented on the lack of local reuse options for treated water. This issue had been identified in 1988 and little appears to have been done to resolve it.

ADEQ response: The Arizona Department of Water Resources is responsible for determining whether the end use of treated water in any proposed remedy is beneficial. As potential remedies are developed, end use options are presented to ADWR for determination. Some reasons that local reuse options may not be advanced are availability of a user and cost considerations. Arizona Revised Statute §49-282.D.3 requires that remedial actions be cost-effective. If less expensive beneficial use options are identified in a feasibility study, it is likely that they will be selected over local reuse. Local reuse options will be evaluated for potential inclusion in future remedies.

Additional options for alternatives

- 1) The GNC suggested that a line of monitor wells along the axis of the plume should have been included.

ADEQ response: A large number of wells already exist throughout the interim remedy study area to monitor plume movement. Although additional monitoring wells will be installed, locating them near the axis of the plume would not meet the monitoring objectives of assessing plume capture.

- 2) Allied GNC recommended a combination of Alternative 64R and Alternative 11, including a scaled-down version of the Alternative 64R portion to capture the 500 part per billion TCE area.

ADEQ response: A version of Alternative 64R smaller than proposed in the FS would likely result in incomplete containment of the entire width of the plume. A combination of alternatives 64R and 11 presents a resource expenditure of a magnitude that would better serve the entire contaminated area. Evaluation of final remedy options will include facilities to address contamination in the area of Alternative 11.

- 3) Allied had additional recommendations for approaching OU2, including encouraging aggressive identification and clean-up of downgradient releases, identifying important data gaps, and developing long-term strategies for low concentration plumes.

ADEQ response: These issues will be factored into ADEQ's approach for identifying a final remedy for the site. ADEQ is already working with Allied, ITT, and Tiernay to characterize the sources on their respective facilities. The first step in identifying a final remedy will be a Remedial Investigation to identify and fill the data gaps. Approaches for all sources contributing to the plume, above MCLs, will be incorporated into the final remedy.

Part II - Comprehensive Response to Specific Legal and Technical Questions

Amount and quality of data

- 1) The COP expressed a concern that insufficient data exist to select Alternatives 21, 64C or 64R. Tiernay Turbines supported this with a concern that the area around Alternative 64R has not been properly characterized. Several of the PRPs pointed out that the density of data nearer the Motorola plant is higher than in the western portions of the site, and the limitations of data in the western portions could not support a remedy selection. Motorola commented that ample study has been conducted to support an interim remedy decision. Motorola commented further that insistence on additional study will only delay plume containment and cleanup, and that complete knowledge of the site will never be possible.

ADEQ response: The density of data available in the western portions of the site is sufficient to support an interim remedy decision, regardless of the higher density of data nearer the Motorola plant. In addition to numerous rounds of groundwater quality sampling in the area, well installations by both Motorola and ADEQ have provided geologic information, and an aquifer test near 27th Street and Adams has provided sufficient information about the characteristics of the aquifer to develop and evaluate remedial alternatives. During that aquifer test, Motorola also performed a short-term test of the ability to reinject water into the aquifer in addition to the ability to withdraw water.

- 2) The PRPs (except Motorola) expressed concerns regarding the existence of a bedrock ridge, or high, near 32nd Street and Washington. The PRPs feel that the impact the bedrock high may have on the alternatives has not been adequately researched and that the bedrock high has not been incorporated into the model. Motorola commented that the bedrock high does not give sufficient cause to not consider Alternatives 64C and 64R.

ADEQ response: A report of preliminary studies to characterize the bedrock high was completed in late February 1994. ADEQ has evaluated this information. The report verified the existence of the high and that its characteristics are only slightly different than those assumed during modeling efforts. ADEQ's evaluation of the data concludes that Alternative 21 would need to be completely reconfigured to be effective. Alternative 64R may require small changes in reinjection well locations, and those determinations would be made during the design phase of the project. Alternative 64C would require minimal consideration of the bedrock high. Alternatives 11 and 11C, east of the bedrock high, would not require consideration of the bedrock high during the design stage.

- 3) The COP commented that the recent gravity survey to locate the bedrock high produced data on subsurface bedrock elevations that were somewhat different than the assumptions placed in the model. The COP recommended that the model be revised to incorporate the new information prior to implementing an interim remedy at or downgradient of the

bedrock high.

ADEQ response: As indicated in the previous response, the differences between the model assumptions and the new bedrock elevation data for the bedrock high do not justify extensive reconsideration of the preferred alternative. During remedial design, the newly collected data be considered and added to the model.

- 4) Allied and the GNC questioned whether additional site characterization is necessary to select a remedy in the area of the preferred remedy.

ADEQ response: Enough data exists for each of the alternatives to select an interim remedy. Data requirements specific to the design of the interim remedy may require additional hydrogeologic characterization.

- 5) Allied expressed a concern that the data gaps in the area near the preferred alternative reduce the ability to compare cost and performance of the various alternatives. Confidence in cost and effectiveness are higher where more data exist.

ADEQ response: As seen in responses to other comments, ADEQ is confident in the data that led to its selection of the preferred alternative. Again, it is true that more data points exist nearer to Motorola, however sufficient data exist in the western portions of the site to evaluate effectiveness and select a remedy. EPA guidance for completing feasibility studies suggests that cost estimates be accurate within -30% to +50%, and the available data for this site allow the FS to have this accuracy.

- 6) A citizen at the public meeting commented that important information regarding the bedrock ridge was not available for review. The citizen also commented that water quality information collected during the bedrock survey was not being provided.

ADEQ response: The bedrock information, with water quality data, was provided in late February 1994, as it became available to ADEQ. At the request of the PRPs and the community, the comment period on the proposed plan was extended to April 6, 1994 to allow time to consider this and other information.

- 7) The technical advisor of the GNC at the public meeting stated that it is difficult to advise his client on a plan where the technical assumptions are outdated, referring to bedrock conditions and model assumptions.

ADEQ response: ADEQ's opinion of the technical data is presented in responses to other comments in this document. In summary, ADEQ believes the technical assumptions were sufficiently current and accurate to support selection of an interim remedy.

Technology concerns

- 1) The COP commented that studies have shown that typical pump and treat remedies are ineffective for restoring aquifers, and questions why in-situ treatments were not considered.

ADEQ response: The objective of this interim remedy is to contain groundwater contaminants, not to restore the aquifer. Properly designed pump and treat actions are very effective at providing containment. In-situ technologies will be considered in the development of final remedy alternatives. Bioremediation tests at other sites in the Phoenix area are being closely watched for potential use at this site.

- 2) The COP questioned whether ADEQ has taken into account any dense non-aqueous phase liquid (DNAPL) contamination and the potential of a pump and treat approach to intensify problems associated with that type of contamination.

ADEQ response: DNAPL contamination consists of undissolved contaminants, or pure product, which are heavier than water and sink to the bottom of the aquifer. Most of the contaminated aquifer at this site contains dissolved contaminants, which move along with the flow of the water instead of sinking. DNAPL contamination has been observed beneath the Motorola plant, however OU1 is intended to keep that DNAPL from contaminating downgradient areas. Another potential source of DNAPLs is the AlliedSignal facility. Trichloroethane (TCA) has been detected in wells at that facility at 26,000 parts per billion, which suggests DNAPLs may exist, although they have not been actually observed. Facilities with DNAPL contamination will likely be required to perform remedies similar to Motorola's OU1 to keep DNAPLs from contaminating downgradient areas.

- 3) The COP requested a clarification on why a containment remedy is being considered, and not a restoration remedy.

ADEQ response: The feasibility of complete aquifer restoration will not be possible to evaluate until the extent of contamination is better defined. By implementing this interim remedy, some control of the contamination is gained and additional information regarding aquifer response to groundwater pumping can be gathered to more effectively develop restoration strategies.

- 4) The COP requested clarification on the synthetic resin technology proposed for treatment of air emissions in regard to contaminants captured and removal efficiency.

ADEQ response: As Section 4.7.2 of the FS states, synthetic resin is capable of capturing VOCs in an air stream, including vinyl chloride. Removal efficiencies listed in the FS for all technologies are based on professional knowledge and review of actual applications of the technologies. During implementation of the remedy, monitoring will

be conducted to ensure proper operation.

- 5) A citizen at the public meeting commented on the potential for earth subsidence due to groundwater extraction.

ADEQ response: The amount of drawdown expected to occur as part of the preferred alternative is less than the seasonal fluctuations in water levels occurring in the area. Therefore the drawdown would not add to any minute amount of natural subsidence that might be seen.

- 6) A citizen at the public meeting expressed a concern that reinjection will push uncaptured contaminants further "downstream" and that it will be difficult to monitor where they are going.

ADEQ response: As proposed in the FS, reinjection associated with the preferred alternative will be upgradient of and north of the extraction location. The reinjection will be designed to provide additional control of contaminants north of the extraction location and will have little, if any, impact west of the containment line.

- 7) A citizen at the public meeting expressed a concern regarding technical difficulties in operation of OU1 that led to releases of vinyl chloride to the air. The comments included lack of public notification of the event.

ADEQ response: Vinyl chloride is not expected in the area of extraction in the preferred alternative. However, OU2 will use synthetic resin to treat air stripper emissions. Synthetic resin will trap vinyl chloride rather than cycling it through the system as OU1 does. OU1 is currently operating after modifications were made to prevent future releases of vinyl chloride. With the sound working relationship that is developing with the Gateway Neighbors, ADEQ hopes that information of any unexpected circumstances can quickly get out to the community.

- 8) The COP questioned statements on page 5-3 of the FS that OU1 is effective. The COP contends that trends in contaminant concentrations in wells across the area are similar to those in OU1 extraction wells, therefore declining concentrations do not immediately suggest effectiveness.

ADEQ response: The OU1 groundwater extraction and treatment system has a similar purpose to that of OU2. OU1's primary purpose is containment of highly contaminated groundwater east of 46th Street. The effectiveness of OU1 is measured by its ability to maintain control of groundwater movement, not its ability to reduce contaminant concentrations. The Administrative Record contains an Operable Unit Effectiveness Report prepared in May 1993 that shows, when operational, OU1 achieves its purpose.

The FS Model

- 1) A citizen at the public meeting commented that the model was only run for a few of the 64 potential alternatives.

ADEQ response: 64 alternatives were proposed for the initial screening of final remedy alternatives. Those 64 alternatives were screened generally on effectiveness, implementability, and cost. Based on that screening, and the decision to develop an interim remedy instead of a final remedy, five alternatives (11, 11C, 21, 64, and 64R) were advanced for further development in the Feasibility Study. Alternative 64C was added to the FS after discharge to the Salt River was not considered a beneficial use of the treated water. Modeling was conducted on those six alternatives, and the "no action" alternative.

- 2) The COP commented that migration of inorganic contaminants was not modeled during the FS.

ADEQ response: It was not the purpose of the FS model to predict the extent of inorganic contaminants. West of the Old Crosscut Canal, fluoride is the only inorganic contaminant detected above Maximum Contaminant Levels in a few monitor wells, and those locations are all east of the Grand Canal. Movement of arsenic, fluoride, and nitrates was modeled in the Draft Report, Investigation of Inorganic Constituents in Ground Water, which is part of the Administrative Record for this site.

- 3) The COP commented that it is unclear from the modeling what aquifer units these containment alternatives are designed to address.

ADEQ response: The volume of groundwater in the alluvium is estimated to be 30 to several hundred times as much as that contained in the same cubic volume of bedrock. Therefore, most of the VOC contaminants will be found in the alluvium. Also, VOC contaminants in groundwater would tend to migrate farther in alluvium than in bedrock. For these reasons, the FS alternatives were designed to achieve containment primarily in the alluvium. However, containment is expected to be achieved to a significant depth into bedrock.

- 4) The COP commented that, while the model is intended to provide a relative comparison of effectiveness of the alternatives, the FS presents quantitative estimates of pounds of TCE removed.

ADEQ response: Comparing the relative effectiveness could have involved a different approach, such as assigning "high", "medium", "low", or "good", "better", "best" to the alternatives. By providing a numerical estimate, the reader is able to consider how much better one alternative is than another, rather than simply noting that one is ranked higher. This becomes very important when considering the interrelation of all factors including

implementability, effectiveness, and cost.

- 5) The COP questioned how the plume sizes depicted in various figures showing 5, 10, and 20 year intervals in Appendix F (modeling) were generated and what they represent.

ADEQ response: For each alternative evaluated in the FS, figures representing the contaminant plume after 5, 10, and 20 years of operation were generated by the model.

- 6) The COP questioned why sources at the Motorola plant other than the drywell in the courtyard were not included in the model. The COP also questioned whether the courtyard source or OU1 should be considered the start of the model.

ADEQ response: It is important to note that the model used in the FS did not include any specific sources, Motorola or otherwise. Modeling of the alternatives included putting actual water quality data from 1992 into the model and then running each alternative into the future. The benefit of this approach is that the cumulative impacts of all historic sources, at Motorola and other companies, are represented by the 1992 water quality data.

- 7) The COP questioned whether contaminant movement since the model was run has been considered in determining the effectiveness of the alternatives.

ADEQ response: The modeling of each alternative begins in the year 1995 to account for contaminant movement during the period of design and construction. This initial condition is represented by Figure F.23. The effectiveness of each alternative was evaluated taking migration of contaminants into account.

- 8) The COP expressed concern that the model results for the preferred alternative indicate that "extremely high" levels of TCE still exist after 20 years of operation. They also note that TCE is shown still coming from the Motorola plant after 10 years of operation.

ADEQ response: The purpose of this interim remedy is to control the movement of contaminants. The "extremely high" levels of TCE identified in the comment are within the capture zone.

TCE shown still coming from the Motorola plant (i.e., downgradient of OU1) is estimated due to residual TCE in the aquifer. OU1 is expected to contain contamination at the Old Crosscut Canal, however concentrations within the OU1 capture zone will not likely be decreased to below 5 parts per billion within 20 years.

- 9) The COP, Allied, and Tiernay all expressed concerns about the assumption in the model that the aquifer is in a "steady-state" condition, (i.e., that erratic changes in groundwater conditions do not exist). Allied and Tiernay identified flood flows in the Salt River as one factor that is not accounted for in the steady-state assumption.

ADEQ response: Over the past 30 years, the Salt River has flowed 641 days at a rate at Granite Reef Dam considered to cause flow in the Salt River near Sky Harbor Airport. The 641 days amounts to 5.9 percent of the 30-year period from 1963 to 1993. 214 of those days (about one-third) were in the 1992-1993 period. Groundwater levels were observed frequently from October 1992 to March 1993. A comparison of this groundwater level data to data prior to flow in the Salt River concludes that river flow did not have significant impact on regional groundwater flow direction. Also, significant changes to upstream dams being made by Salt River Project, will reduce the likelihood of flooding and any potential impact flooding would have on groundwater flow.

- 10) The COP questions how ADEQ considers the model to be appropriate when ADEQ staff have reviewed the model and consider it inadequate. The COP requested that comments prepared by ADEQ staff be addressed in this responsiveness summary.

ADEQ response: The COP specifically references comments made by Yongshou Luo of ADEQ's Technical Services Hydrology Unit. Mr. Luo's comments were on the modelling approach originally taken by Motorola, to model historic sources from the past into the present and future. His comments served to identify limitations in the model that ADEQ considers when evaluating the outputs. Mr. Luo's comments were also important in the decision to start the model using actual water quality data, rather than sources modeled through time. Because the FS modeling approach was changed due to Mr. Luo's comments, his comments on the previous modeling approach will not be specifically addressed in this responsiveness summary.

- 11) The COP suggested that a detailed independent review of the model be done.

ADEQ response: ADEQ reviews all aspects of Motorola's modeling efforts. Frequent meetings during model development have been necessary, and ADEQ required modifications to the model as necessary. For evaluating potential alternatives for the final remedy, ADEQ has approached the group of PRPs to form a modeling committee. The purpose of that committee will be to reach a consensus on modeling issues including which model to use, various parameters, and standardized data formats. This committee should be able to identify agreeable modeling conditions to identify future remedies.

- 12) The COP requested clarification of statements in the FS that the Motorola plume has been modeled to extend to 24th Street while field data shows a much larger plume.

ADEQ response: Motorola initially modeled the migration of contaminants historically released only at the 52nd Street plant from the 1950's to the present. This showed a plume from the 52nd Street plant to 24th Street. That initial modeling is not consistent with field data because it did not include uncharacterized sources, such as potential sources at AlliedSignal, ITT Cannon, and Tiernay Turbines. Other reasons the initial modeling did not reflect field conditions may be limitations of the initial assumptions about the nature of the releases at the Motorola plant, and limitations of the model

identified elsewhere in these comments and in past comments made by ADEQ staff. Changing the model approach in the FS to use current groundwater data, instead of modeled estimates, allowed all sources to be considered and eliminated this discrepancy.

- 13) Allied questioned how ADEQ will demonstrate that the model is suitable, considering the limitations.

ADEQ response: ADEQ has guided the development and use of the model. ADEQ understands the limitations, and has made adjustments necessary to evaluate interim remedy alternatives. In that purpose, the model has been a useful and appropriate tool, although not perfect. Additional modeling will be conducted during remedial design, and may result in modifications to the remedy, if necessary to meet the objectives of this interim remedy.

- 14) Allied commented that the use of rising head tests does not provide a basis to evaluate changes in hydraulic conductivity with direction

ADEQ response: Pumping test data, not rising head tests, were used to evaluate changes in hydraulic conductivity with direction. The pumping tests, the largest of which was conducted at well DM 518 between the locations of alternatives 21 and 64, indicated that there is no change in hydraulic properties with horizontal direction from the pumping well.

- 15) Allied expressed concern that the model inputs were based on interpretations of 1992 groundwater quality data, rather than the actual data.

ADEQ response: Figures F.14 and F.15 in the FS represent late 1992 contours of contaminant concentrations in alluvium and bedrock as they were input to the FS model. Since actual groundwater quality data do not exist for each of the 81,000 cells in the model, professional judgements were made using water quality data that do exist to generate the contours and develop data for use in the model. Several anomalous data points were excluded during generation of the contours to allow smoother contour lines, necessary for input to the model. Those anomalies may represent undefined sources or variations in subsurface conditions. The model was not intended to precisely predict future groundwater quality. The methods used in the FS model are sufficient to allow a comparison of remedial alternatives.

- 16) Allied expressed concern that only 1992 water quality data was used to calibrate the model and not historic data as well. Allied also commented that, while 1992 water quality data were used, 1992 groundwater elevations were not used because they were abnormal.

ADEQ response: 1992 groundwater quality data were used because numerous groundwater monitoring wells were installed during 1992, which greatly expanded the

water quality data base and the understanding of regional groundwater quality. 1992 water elevation data were not used in the model since the preceding period was unusually wet and not representative of normal conditions in the area. This approach allowed both the water quality data and the water elevation data to be reasonably representative and allow relative comparisons between alternatives in the FS.

ADEQ contaminant contour maps

- 1) In Allied's comments, they refer to contaminant contour maps generated by ADEQ staff as a "conceptual model".

ADEQ response: The contaminant contour maps prepared by ADEQ staff in August 1993 are not a model of any kind. The maps merely represent the extent of contamination in groundwater based on groundwater sampling in late 1992. The maps are used by ADEQ, along with other information, to create a conceptual model for the site.

- 2) Allied commented that ADEQ's contour maps present an unlikely worst case scenario since the single highest detected concentrations in multi-depth wells were used.

ADEQ response: Using the highest detected concentrations from multi-depth wells to prepare a two-dimensional map of the plume is the most conservative approach and most protective of the public health and the environment. The contour maps were rigorously peer-reviewed by four ADEQ staff hydrologists. ADEQ feels that the maps accurately reflect the field conditions. ADEQ intends to update the maps semi-annually as new data are generated.

- 3) Allied commented that the bedrock high recently investigated was not given sufficient weight in the ADEQ's contour maps.

ADEQ response: At the time that the maps were generated, ADEQ only knew of the potential that the bedrock high might exist. This potential was considered during the creation of the maps. Results of the bedrock high investigation will be considered in future updates of the maps.

- 4) Allied questioned the technique used by ADEQ in generating the contour maps and suggested a logarithmic approach be taken rather than an apparent "eyeball" approach.

ADEQ response: As indicated in previous responses, the maps were peer-reviewed by four staff hydrologists. Their combined professional expertise was used to generate maps that ADEQ is confident with. Figure 1.6 in the FS was used in the evaluation of alternatives for this interim remedy, not the contour maps generated by ADEQ.

- 5) Allied commented that there is no support of ADEQ's contour maps contained in the Administrative Record for the site.

ADEQ response: The contour maps were generated to define the extent of contamination in the East Washington Water Quality Assurance Revolving Fund area. Supporting documentation, in the form of laboratory data sheets from the groundwater quality analysis, can be found in files for that site. The memo containing the contour maps is in the Administrative Record and provides a tabular summary of the groundwater quality data and a textual explanation of the maps.

- 6) Allied commented that the same data limitations that plague the FS model impact ADEQ's contour maps and overestimate the downgradient distance of the 500 part per billion TCE contour. Allied contends that, using a logarithmic mapping approach, the 500 part per billion TCE contour ends near 24th Street.

ADEQ response: Allied's interpretation is not supported by groundwater quality results from wells installed by ADEQ west of Interstate 10. In the maps, those wells are identified as numbers 10 and 13, and they indicate concentrations of TCE in 1992 of 430 and 560 parts per billion, respectively.

The FS and Comparison of Alternatives

- 1) The COP commented that estimates of TCE removed for each alternative don't correlate with estimates of recovered solvent plus air emissions.

ADEQ response: The COP is correct in its observation that there is no clear correlation between the estimates of TCE removed from the aquifer (see Figure 6.11 and Table 7.6 of the FS) and the sum of waste solvents recovered and VOC air emissions (see Table 7.2 of the FS). This lack of apparent correlation occurs because the estimates were prepared for different purposes using different methodologies.

The groundwater flow and transport model was used to calculate the quantities of TCE removed from the aquifer (see Figure 6.11 and Table 7.6 of the FS) under each alternative. These estimates were used to compare relative performance of the alternatives, rather than to provide a precise estimate of mass removed. The amount of solvents entering the treatment plant that is either recovered as waste solvent or emitted to the air (in compliance with air emission limits) was estimated based on the highest late 1992 concentrations observed near the proposed extraction well locations. The resulting numbers represent initial rates of waste solvent recovered and VOC air emissions, both expressed in lbs/day, and are intended to be conservative (i.e., on the high side) to anticipate the maximum amount of wastes to be handled at the treatment plant. Thus, for any alternative, if you take the sum of initial rates of solvent recovered and VOC air emissions and multiply it by the number of days in 20 years, the resulting figure is much greater than the model-generated estimate of TCE mass removed.

- 2) Allied commented that the estimates of TCE removed are misleading due to data limitations and suggests that a range should have been provided instead of a specific number.

ADEQ response: See the response to the preceding question. The estimates of TCE removed were not intended to be precise, but to allow comparative analysis between the alternatives in the FS.

- 3) The GNC commented that the estimates of TCE removed did not include TCE removed from the bedrock portion of the aquifer. Alternative 11 would remove TCE from the bedrock, while 64R would not.

ADEQ response: See response to question 3 under the "The FS Model" category.

- 4) The COP questioned whether the costs to decommission each of the alternatives was included in the cost estimates.

ADEQ response: The costs of decommissioning equipment were not included because they are not relevant until the final remedy is known.

- 5) The COP commented that detailed cost information was provided only for Alternative 11, and that all costs should have been included. This concern was also presented by a citizen at the public meeting.

ADEQ response: EPA guidance on FS reports suggests summary cost information for all alternatives be provided in the main body of the report and inclusion of detailed cost information of better alternatives as an appendix. Appendix D of the FS presents detailed cost calculations for Alternative 11. This alternative was agreed upon for the appendix by ADEQ, EPA, and Motorola because it included virtually all of those components that are found in the other alternatives. One component of Alternative 11, activated alumina adsorption for treatment of fluorides, is unique to that alternative, further supporting its use as an example of detailed cost calculations. While total costs for each alternative vary, the unit costs (i.e., per extraction well, injection well, air stripper, piping, etc.) remain constant for each alternative. ADEQ and EPA reviewed cost information to ensure that unit costs were consistently applied. Also, Dames & Moore made the worksheets used to estimate costs for each of the alternatives in the FS available to the PRPs and the GNC during a coordination meeting on January 26, 1994.

- 6) The COP commented that due to the conceptual nature of the alternatives, costs may be underestimated.

ADEQ response: The purpose of developing costs in the FS is to provide estimates suitable for comparing alternatives. The cost of the selected alternative will be fully developed during remedial design. EPA guidance for completing feasibility studies

suggests that cost estimates be accurate within -30% to +50%, and this FS is consistent with guidance.

- 7) The COP expressed concern that specific aquifer parameters were not included in the FS.

ADEQ response: Specific aquifer parameters are included in other documents in the Administrative Record, including the October 1993 Aquifer Test Report, Well DM-518.

National Contingency Plan (NCP)

- 1) The COP recommended that the NCP be used to guide the remedial activities at this site rather than 1988 EPA guidance, since portions of the guidance have been superseded or changed.

ADEQ response: In providing regulatory oversight of the remedial activities at the site, ADEQ and EPA ensure that requirements of the NCP are met. The particular FS reference cited by the COP in the comments is to the area where the nine criteria for evaluating remedial alternatives are identified. The criteria in the 1988 EPA guidance and the NCP are identical.

- 2) The COP commented that ADEQ and EPA have stated that they are exempt from certain NCP requirements when selecting an interim remedy. Citations to legal authority were requested.

ADEQ response: ADEQ and EPA have never claimed that they are exempt from NCP requirements, but rather that the NCP provides for waiver of certain requirements (i.e., ARARs) when selecting an alternative that is an interim measure [40 CFR 300.430(f)(1)(ii)(C)]. This type of waiver is also provided for in CERCLA [§121(d)(4)(A)].

The remedial action selected for Operable Unit 2 is intended to limit further migration of contaminated groundwater. This is considered to be an interim action, and cleanup of the aquifer is outside the scope of this remedy. Therefore, aquifer cleanup standards (which would typically be ARARs for a groundwater cleanup remedy) do not apply to the selected remedy. As a result, ADEQ and EPA are not proposing to waive any ARARs.

- 3) The COP commented that the NCP contains different requirements for "removal" actions and "remedial" actions. The COP's opinion is that this is a removal action and that some NCP requirements are left to be met. The features that distinguish it as a removal are: (1) The interim remedy is not expected to achieve ARARs in the groundwater and there has been no waiver of ARARs; (2) it does not appear to be an incremental portion of a comprehensive remedial action plan; (3) it has been justified solely on the basis of protecting public health from an allegedly imminent risk if action is not implemented;

(4) a limited group of response technologies were considered; and (5) the response action was selected without benefit of complete site characterization and other analyses required for "remedial" actions.

ADEQ response: The selected response action is considered to be a remedial action, not a removal action. Either type of response action may be justified when a release of hazardous substance poses a threat to public health.

The groundwater containment remedy for OU2 was selected consistent with the RI/FS and remedy selection process for remedial actions outlined in section 300.430 of the NCP. One of the program management principles stated in that section of the NCP is that sites should generally be remediated in operable units when phased analysis and response is appropriate given the size and complexity of the site. There is no requirement that operable units be part of a "comprehensive remedial action plan", but only that they should not be inconsistent with nor preclude implementation of the expected final remedy. ADEQ believes that the selected remedy meets these criteria with respect to potential final remedies for groundwater contamination at the site.

Neither the NCP nor EPA guidance envision that "complete site characterization" will be achieved at the time an operable unit is selected, particularly an interim action remedy. The FS evaluated a full range of technologies for containment, treatment, and disposal of treated groundwater within the context of a remedial action whose objective is containment of contaminated groundwater (versus cleanup of the aquifer).

- 4) The COP identified a portion of the NCP that allows staged implementation of response actions "when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or complexity of the site, or to expedite the completion of total site cleanup". The COP requested clarification on whether this interim remedy is a phase of the remediation and how it achieves significant risk reduction.

ADEQ response: Yes, this interim remedy is a part of a phased approach. The size and complexity of this site meet the referenced criteria identified in the NCP for implementing a phased approach. Risk reduction will be achieved by limiting the further migration of contaminants (i.e., by reducing toxicity, mobility or volume by treatment). This phase, OU2, follows OU1 which contains the highest levels of contaminants to near the Motorola plant.

- 5) Allied expressed a concern that the uncertainties associated with Alternative 64R invalidate its selection as being inconsistent with the NCP.

ADEQ response: The "Amount and quality of data" section beginning on page 13 of these responses discusses these concerns more specifically. As the responses indicate, there is sufficient information to support and proceed with this interim remedy.

- 6) The COP commented that the goals identified in the FS are broad generalizations and do not meet the requirements of the NCP.

ADEQ response: The remediation goals are identified in the FS on page 2-10 and reiterated in the Record of Decision. They are described in terms of containing migration, treatment of extracted groundwater, and achieving ARARs. These objectives are appropriate for the scope of the interim remedial action being considered and are fully consistent with the NCP and EPA guidance for interim remedial actions.

Applicable or Relevant and Appropriate Requirements (ARARs)

- 1) The COP commented that the interim remedy will not meet all ARARs and the FS does not discuss waivers of those ARARs.

ADEQ response: Since the OU2 action is an interim action, chemical-specific cleanup requirements for the aquifer, such as attaining Maximum Contaminant Levels as would be ARARs for a final remedy, are beyond the scope of this interim action. Since aquifer cleanup requirements are not ARARs for this interim action, no ARARs waivers are needed.

- 2) The COP's comments indicate they are aware of an October 20, 1992 letter specifying potential ARARs for the remedy. The COP comments ask if further ARARs development has been conducted since then.

ADEQ response: ARARs are identified in the Record of Decision. The proposed ARARs in the October 1992 letter have been reviewed and updated as changes in requirements are identified. One ARAR change identified by ADEQ, as well as the COP in another comment, is that Arizona Health-based Guidance Levels are not ARARs. The finalized list is presented in Section 10 of the Record of Decision.

- 3) The COP commented that the ARARs identified in the FS are incomplete because they cover only ARARs for the aquifer and not for other media and activities.

ADEQ response: The COP's comment refers to Table 2.4 specifically, which lists chemical-specific ARARs for groundwater. These ARARs also limit the levels of contaminants that can be discharged (or reinjected) to the aquifer. A discussion of action, location, and chemical specific ARARs is contained in sections 2.4 and 2.5 of the FS.

Other legal concerns:

- 1) The COP commented that, since the remedy is being conducted "on-site", air emissions from Motorola's manufacturing processes and OU1 should be added to the potential emissions from this remedy and treated as one source.

ADEQ response: According to the Maricopa County Air Pollution Control Board, air emissions from this remedy would be considered a separate source if the treatment facilities are outside contiguous property owned by Motorola. ADEQ will encourage that appropriate permits be obtained for this remedy when the application process does not interfere with a timely response, however CERCLA (§121(e)) and the NCP (40 CFR 300.400(e)) allow that permits do not have to be obtained within the NPL site as long as the substantive requirements of the permits are met.

- 2) The COP pointed out that Motorola's intent to discharge a backwash stream from the groundwater treatment system to the COP sewer system will require a permit.

ADEQ response: CERCLA requires that on-site response actions meet the substantive requirements of permits, although applying for permits is not required. However, ADEQ will encourage that permits be pursued unless the application process inhibits a timely response. ADEQ appreciates the COP's effort to identify this need.

- 3) The COP further clarified the infeasibility of the beneficial use option of discharge to storm drains which lead to the Salt River by citing 33 U.S.C §1342(p)(3)(B)(ii). Also, the COP commented that the discharge would not be allowed by COP without a National Pollution Discharge Eliminations System (NPDES) permit.

ADEQ response: This end use option was determined by the Arizona Department of Water Resources not to meet the beneficial use requirement and ADEQ removed it from consideration. ADEQ nonetheless appreciates additional information to clarify requirements that would apply to alternatives evaluated in the FS.

- 4) The COP noticed a typographical error in the FS citing Arizona Aquifer Water Quality Standards as R18-11-495 instead of R-18-11-405. The COP also commented that references to federal Maximum Contaminant Levels (MCLs) should be replaced by references to Arizona Aquifer Water Quality Standards.

ADEQ response: ADEQ appreciates the clarification and will ensure appropriate citations in the list of ARARs. Arizona Revised Statute §49-223 requires that MCLs be adopted as Arizona Aquifer Water Quality Standards within one year of establishment by EPA, therefore MCLs are equivalent to Arizona Aquifer Water Quality Standards.

- 5) The GNC expressed a concern that implementation of the preferred alternative may force litigation among PRPs which could delay meaningful cleanup.

ADEQ response: ADEQ cannot control the decisions by interested parties to file lawsuits. This interim remedy was selected based on criteria specified in the NCP. Formal legal agreements will be reached with those parties expected to implement OU2, or enforcement action will be taken to ensure timely response.

D. REMAINING CONCERNS

- 1) A citizen commented that social and political activists with no scientific background cause hysteria regarding these sites.

ADEQ response: An increasingly important part of ADEQ's mission is to increase community awareness regarding these environmental hazards. With increased awareness, potential hysteria can be avoided.

- 2) A citizen commented that ADEQ personnel are political appointees who are not qualified to manage these projects.

ADEQ response: The only appointed personnel at ADEQ are the Director and the individual Division Directors. All other personnel received their employment through the State personnel system process for covered employees. No one person manages these Superfund sites. Staff with varied backgrounds, including hydrology, geology, resource management, civil engineering, chemical engineering, toxicology, and legal backgrounds are consulted regularly in the normal operation of these projects.

- 3) A citizen commented that there are much bigger social issues than Superfund, such as housing, hunger, and alcohol and drug abuse.

ADEQ response: These other issues are beyond the mission of the ADEQ and beyond the response authority of CERCLA. Other state and federal programs exist to address these issues.

ATTACHMENT

Community involvement activities at Motorola 52nd Street, since late 1991

Fact sheets:

March 1992: Information on ADEQ conducted soil gas investigations
Summer 1992: ADHS Risk Assessment and soil gas results
Summer 1993: Introduction of area-wide plume map
Winter 1994: Proposed Plan for Operable Unit Two
February, 1994: Brief notice of comment period extension

Large events:

December 9, 1991: Informational meeting at Balsz Elementary School
July 13,14,15 1993: Series of open houses regarding plume map
January 25/27, 1994: Open houses regarding Proposed Plan for OU2
February 3, 1994: Formal public meeting regarding Proposed Plan for OU2

Citizens Committee meetings (various topics):

4/1/92, 4/8/92, 4/29/92, 5/20/92, 6/22/92, 7/22/92, 8/5/92, 8/19/92, 9/22/92, 10/22/92,
11/19/92, 12/17/92, 1/21/93

Informal sessions with Gateway Neighborhood Coalition:

5/19/93: Reception for TAG committee
6/9/93: Library search
6/30/93: Discussion of plume map fact sheet
7/12/93: Preview of open house presentations
2/24/94: Clarifications on Proposed Plan for OU2

E-4070-5.3.1

**MOTOROLA, INC
(52ND STREET PLANT)
SUPERFUND SITE**

Phoenix, Arizona

**EXPLANATION OF SIGNIFICANT DIFFERENCES
TO
OPERABLE UNIT 2
RECORD OF DECISION**

ADMINISTRATIVE RECORD FILE

Oversize Document

Document: 46816

Supplement 2: September 30, 1999

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION IX



**UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION IX**

EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD #1)

to

July 1994 Record of Decision, Operable Unit Two
East Phoenix Groundwater Containment

MOTOROLA 52nd STREET SUPERFUND SITE

PHOENIX, ARIZONA

September 1999

ESD #1 Motorola 52nd Street OU2

I. Introduction:

The Motorola 52nd Street Superfund Site (Site) is located in Phoenix, Arizona in Maricopa County. The Site was listed on the NPL on October 4, 1989. The Arizona Department of Environmental Quality (ADEQ) was designated the lead agency at the Site. The United States Environmental Protection Agency Region IX (EPA) issued an Amended Administrative Order for remedial action (RA) at Operable Unit Two (OU2) and is now the lead agency for OU2 RA at the Site. The Arizona Department of Environmental Quality (ADEQ) is the support agency for OU2.

This Explanation of Significant Differences (ESD) modifies the interim remedial action selected by ADEQ and EPA in the OU2 Record of Decision (ROD), signed in July 1994. This ESD was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) section 117(c), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) section 300.435(c)(2)(i), and "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents", July 1999. This ESD is based on information contained in the Administrative Record for the Site.

This ESD is necessary due to developments during the design of the groundwater treatment system for OU2. The OU2 ROD specified either air stripping or ultraviolet oxidation as a treatment technology and reinjection as a beneficial end-use of treated groundwater. EPA and ADEQ have determined that the use of carbon adsorption and ultraviolet oxidation for groundwater treatment and the discharge of the treated groundwater to the Grand Canal for end-use are efficient and cost effective modifications to the selected remedy.

This ESD will become part of the Administrative Record File (NCP 300.825(a)(2)), and will be available for review from 8:00am to 5:00pm Monday through Friday, excluding holidays, at EPA Region IX Superfund Records Center, 95 Hawthorne St., San Francisco, CA and ADEQ's offices at 3033 N. Central Avenue, Phoenix, AZ, and at the Saguaro and Central Branches of the Phoenix Public Library, located at 2808 N. 46th Street and 1221 N. Central Avenue, respectively, which are open on evenings and weekends as well as during regular business hours.

II. Summary of Site History, Contamination Problems, and Selected Remedy:

Activities at the Motorola 52nd Street Superfund Site began with Motorola's reports of releases of hazardous substances from the Motorola Inc. Semiconductor Products Plant at 5005 East McDowell Road in Phoenix, Arizona. Investigations of this facility and of the AlliedSignal Inc. Turbine Engines facility located at 111 South 34th Street initiated under Arizona's Water Quality Assurance Revolving Fund (WQARF) program identified these facilities as potential sources of groundwater contamination. Figure 1 shows the relative locations of the Motorola and AlliedSignal facilities within the Phoenix area. The combined releases from source areas have created extensive groundwater contamination in the area. Figure 2 shows the currently known extent of trichloroethylene (TCE) contamination. Other volatile organic contaminants (VOCs)

ESD #1 Motorola 52nd Street OU2

are also present; however, the known areal extent of TCE contamination reasonably encompasses the other contaminants.

A Consent Order was executed in July 1989 between ADEQ and Motorola for the design and implementation of Operable Unit One (OU1). OU1 addresses solvents in on-site soils and the containment of groundwater contamination from the Motorola facility to approximately 40th Street near the Old Crosscut Canal. The OU1 groundwater treatment system, located in the courtyard of the Motorola plant, has been in operation since May 1992. The on-site soil vapor extraction (SVE) treatment system operated in 1992 and 1997.

Volatile organic compounds (VOCs) in concentrations exceeding the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) for drinking water have been detected in groundwater extending well beyond 40th Street. ADEQ and EPA selected groundwater extraction and treatment at Washington Street and the Interstate 10 Freeway as the interim remedial action for OU2. The interim remedy is described in the Record of Decision, Operable Unit Two, East Phoenix Groundwater Containment, Motorola 52nd Street Superfund Site (7/21/94) (the OU2 ROD). This ROD is located in the Administrative Record File.

OU2 addresses groundwater contamination in the area west of the Old Crosscut Canal and east of Interstate 10. The contaminants of concern for OU2 are TCE, tetrachloroethylene (PCE), 1,1,1-trichloroethane (TCA), and their associated degradation products, including vinyl chloride. The primary remedial action objectives of OU2 are to establish a capture zone across the entire width and depth of the contaminant plume in the area of Interstate 10 and to reduce contaminant concentrations within the alluvial aquifer upgradient of the extraction wells. Hydrogeologic data collected during this interim action will facilitate development of a final remedy for the Superfund Site. On November 30, 1998, EPA issued an Administrative Order (No. 98-15) to Motorola and AlliedSignal to conduct the remedial action for the OU2 Interim Remedy.

The major components of the 1994 selected remedy for OU2 include:

- Installation of wells and extraction of groundwater in the vicinity of Interstate 10 and Van Buren Street;
- Treatment of extracted water near extraction locations by either air stripping with off-gas treatment by synthetic resin adsorption, or advanced oxidation based on final design considerations; and
- Installation of injection wells and injection of treated water back into the aquifer in locations allowing additional control of the contaminant plume.

The extracted water was to be treated for VOCs to meet drinking water standards. The OU2 ROD states that treatment of the extracted groundwater for removal of VOCs will be accomplished using either air stripping (with treatment of air emissions and off-site incineration of recovered solvents) or advanced oxidation (which utilizes ultraviolet light to destroy VOCs). These two technologies are discussed in detail in the Interim Remedy Feasibility Study. This

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report is located in the Administrative Record File. According to the OU2 ROD, the treated water would be injected back into the ground. Injection wells were to be located east of Interstate 10 at the northern edge and central portion of the plume.

The extraction and treatment system is expected to contain approximately 2.6 square miles of the contaminant plume beyond OU1 and to remove approximately 2000 gallons of TCE from the aquifer over a 20 year period. (Gallons of TCE removed is provided for comparison purposes. Other VOCs will also be removed.) The ROD requires that the capture zone be achieved within one year of system start-up.

III. Description of the Significant Differences and the Basis for those Differences:

The major components of the revised remedy for OU2 include:

- Installation of wells and extraction of groundwater in the vicinity of Interstate 10 and Van Buren Street (as designated in the OU2 ROD);
- Treatment of extracted water to drinking water standards using carbon adsorption and ultraviolet oxidation at a treatment plant located near extraction wells; and
- Discharge of treated water to the Salt River Project (SRP) Grand Canal and used for agricultural irrigation and agricultural livestock.

Documents supporting the changes described below include the OU2 Remedial Design Work Plan, the OU2 Preliminary (30%) Design, and the OU2 Pre-final (90%) Design Reports, all of which can be found in the Administrative Record File. The estimated 30-year present value cost (at 5% interest) to construct and operate the revised treatment system is \$24 million. This is less than the \$31 million estimated in the ROD for the selected remedy.

A. Use of Ultraviolet Oxidation and Carbon Adsorption In Lieu of Air Stripping:

The 1994 ROD specified the use of air stripping of the contaminated groundwater with off-gas treatment of the volatilized contaminants by synthetic resin adsorption, and, if effective and economical, the use of advanced oxidation in lieu of the air stripping technology. In addition to air stripping and advanced oxidation, the FS evaluated the use of granular activated carbon as well. During the design, each treatment alternative was further evaluated for effectiveness and cost. The 30% and 90% Remedial Designs propose a combination of carbon adsorption and ultraviolet oxidation to be the most effective and economical treatment. Therefore, to eliminate air emissions and to reduce costs, an advanced oxidation pre-treatment (for vinyl chloride treatment) combined with continual granular activated carbon treatment is being chosen to replace air stripping as the treatment alternative for the groundwater. The used carbon will be sent off-site for regeneration, re-use or disposal. The new treatment system must still be able to treat the extracted water at rates sufficient to maintain hydraulic capture as well as meet drinking water standards.

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B. Discharge to the Grand Canal In Lieu of ReInjection:

The Supplement to the Interim Remedy Feasibility Study Report, December 1993, presented Alternative 64C, describing a remedial action designed to pipe the treated water to the Grand Canal for irrigation use, rather than reinjection of the treated water back into the aquifer. Comments on the Proposed Plan suggested that this alternative was preferred by the community because the costs and traffic disruptions were lower and because there would be a more immediate beneficial use of the treated water. At the time the remedy selection was being made, it did not appear feasible for Salt River Project (SRP), which maintains and operates the canal, to take the treated water. During the past several years, however, SRP and Motorola have reached an agreement wherein SRP will accept all of the treated water for use with agricultural irrigation and livestock (3/1/99 letter from Motorola & SRP to ADEQ & EPA).

Although reinjection is typically considered by the Arizona Department of Water Resources (ADWR) to be the most preferred beneficial end-use of remediated groundwater, discharge to the canal is still considered an appropriate beneficial end-use. There will be significant costs saving to the remedy since long-term operation and maintenance costs associated with reinjection to the aquifer are much higher than with discharge to the canal. There is no expected increase of risk to human health and the environment since the treatment standards are also protective for the designated end-use. Discharge to the canal will result in less disruption to the community since there will be a new pipeline route in a less dense area with wider streets, and there will no longer be a need for reinjection well construction. Discharge to the Grand Canal, and therefore operation of the groundwater treatment system, will be interrupted for approximately one month every year. Motorola has provided documentation that supports that this interruption in pumping will not impact groundwater capture efficiency and would have also been necessary with reinjection to allow for reinjection well cleaning and well/piping maintenance and repairs (11/23/98 letter from Motorola to ADEQ).

C. Applicable or Relevant and Appropriate Requirements (ARARs)

The 1994 ROD included action-specific ARARs for air stripping and reinjection. As air stripping and reinjection are no longer necessary for the remedy, the following requirements identified in the 1994 ROD are no longer ARARs:

- 40 C.F.R. Part 265, Subpart AA and BB, Resource Conservation and Recovery Act (RCRA) requirements applicable to air stripper emissions
- EPA OSWER Directive 9355.0-2.8 (June 1989) concerning air stripper emissions from air strippers used for groundwater treatment at Superfund sites.
- Arizona Hazardous Waste Management Act, AAC R18-8-264 & 40 CFR Subpart X requirements for miscellaneous RCRA units.
- Arizona Revised Statutes for discharge to an Aquifer A.R.S. §49-241 through 49-244, and implementing regulations, A.A.C. R18-9-101, et seq.

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The following additional ARARs are added to the 1994 ROD with respect to the revised remedy:

- Federal Hazardous Materials Transportation Law, 49 U.S.C. §§ 5401, et seq. (formerly the Hazardous Materials Transportation Act) and associated rules, 40 C.F.R. Parts 107, 171.1 - 172.558. This law regulates the transportation of hazardous substances.
- Section 402 of the Clean Water Act, 33 U.S.C. §1342 requires a National Pollutant Discharge Elimination System ("NPDES") permit for discharge of pollutants to waters of the United States. Discharge to the Grand Canal is within the Site boundary, therefore, the substantive requirements of §402 of the Clean Water Act is an ARAR.

In summary, EPA and ADEQ expect that this remedy will contain the same volume of water, remove the same amount of VOCs, and achieve the capture zone within one year of system start-up, as in the originally selected remedy.

IV. Support Agency Comments:

The lead agency (EPA) and support agency (ADEQ) jointly developed this ESD. The support agency has no additional comments.

V. Affirmation of the Statutory Determinations:

Considering the new information that has been developed and the changes that have been made to the selected remedy, ADEQ and EPA believe that the revised remedy remains protective of human health and the environment, and is cost effective. The revised remedy complies with federal and state requirements identified in the ROD or the Interim Remedy Feasibility Study as ARARs at the time the ROD was signed, with the exception of those federal or state requirements that are no longer ARARs for the revised remedy. The OU2 remedy is an interim remedy and is not intended to fully address the statutory mandate for permanent solutions and alternative treatment technologies to the maximum extent practicable for the site (section 121 of CERCLA). Changes to the remedy documented in this ESD will not be inconsistent with the Final ROD.

VI. Public Participation Compliance:

The public participation requirements set out in the NCP section 300.435(c)(2)(i) have been met. ADEQ issued one fact sheet and has held two open house public meetings in the OU2 area during the OU2 remedial design process, allowing public participation regarding the proposed design. EPA's Technical Assistant Grant recipients, the Gateway Neighborhood, have participated in technical meetings during the design review. SRP notified their irrigation customers that they will be accepting treated water from the Site in an August 1999 newsletter. There has been no response from SRP customers to date.

Public notice will be issued in the *Arizona Republic* newspaper that the ESD has been signed and that the contents of the Administrative Record File are available. EPA will also prepare a fact sheet announcing the ESD and approval of the Final (100%) Remedial Design and will hold public meetings prior to start of construction.

ESD #1 Motorola 52nd Street OU2

Keith Takata

Keith Takata, Director
Superfund Division
USEPA Region IX

9-10-99

Date

Jean A. Calhoun

Jean A. Calhoun, Director
Waste Programs Division
Arizona Department of Environmental Quality

8/15/99

Date

ESD #1 Motorola 52nd St. OU2

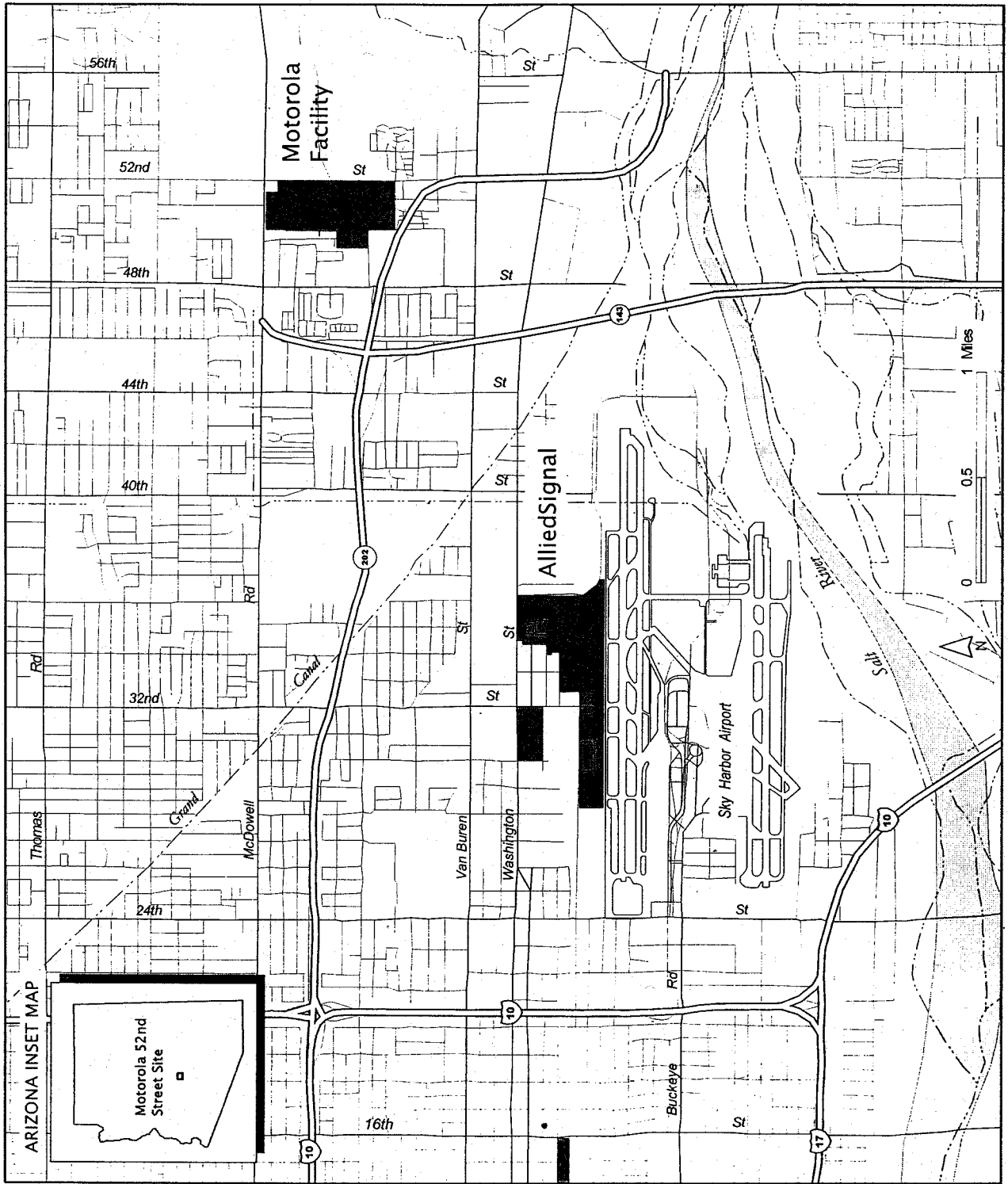
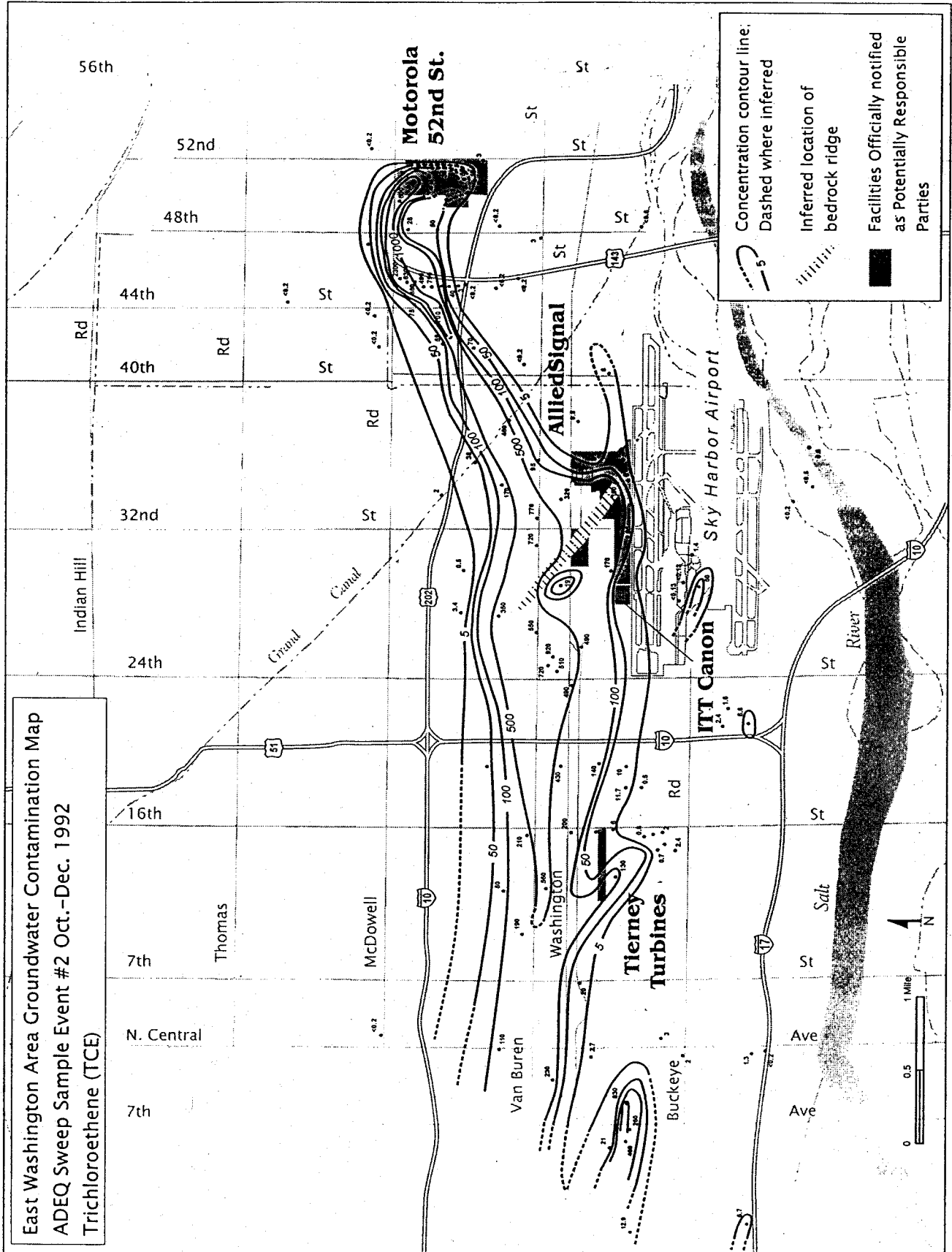


Figure 1. Site Vicinity Map

ESD #1 Motorola 52nd St. OU2

Figure 2. Extent of TCE Contamination in Groundwater



All concentrations in micrograms per liter (parts per billion or ppb)
Adapted from 1994 OUZ Record of Decision